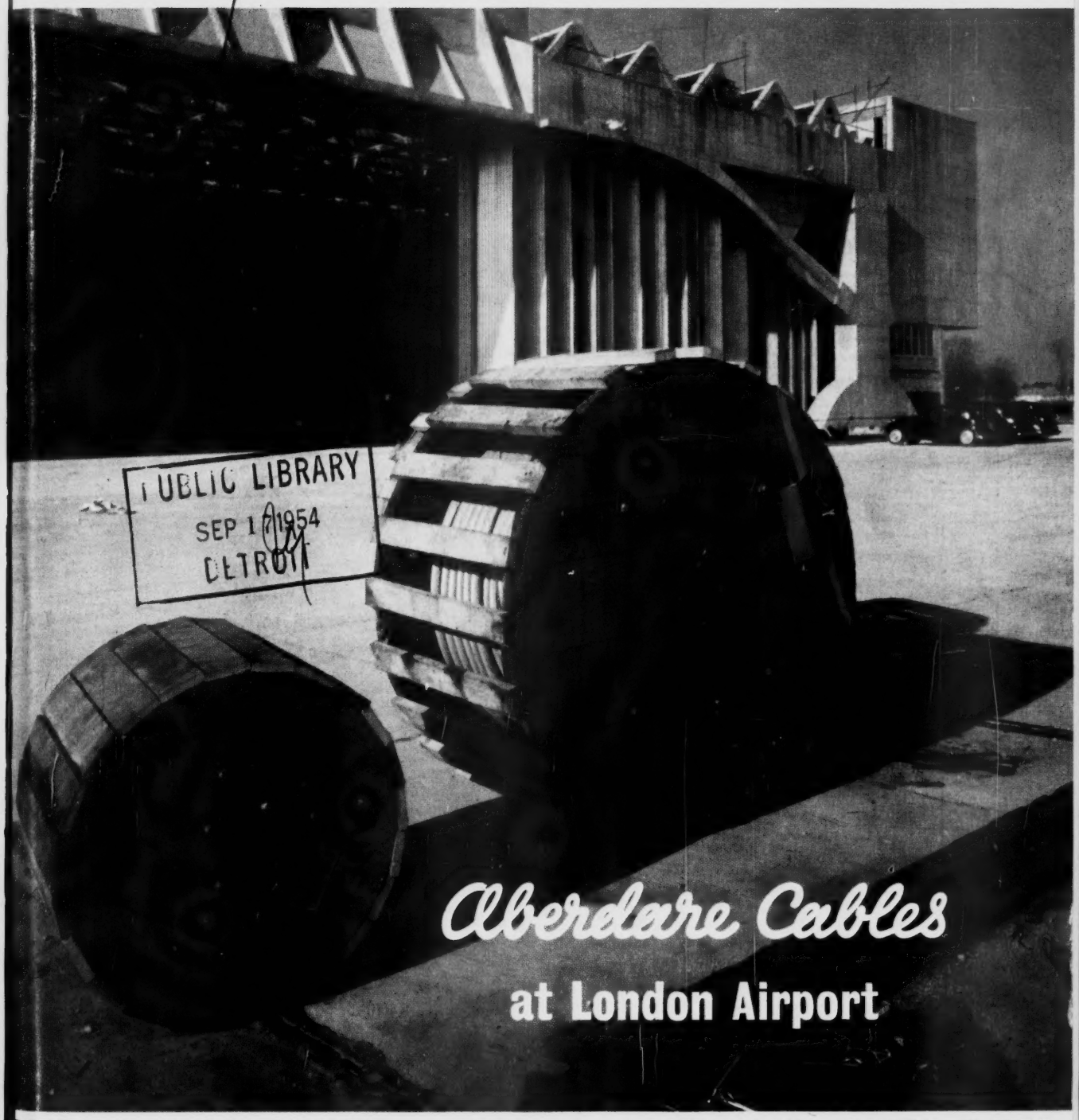
ELECTRICAL REVIEW



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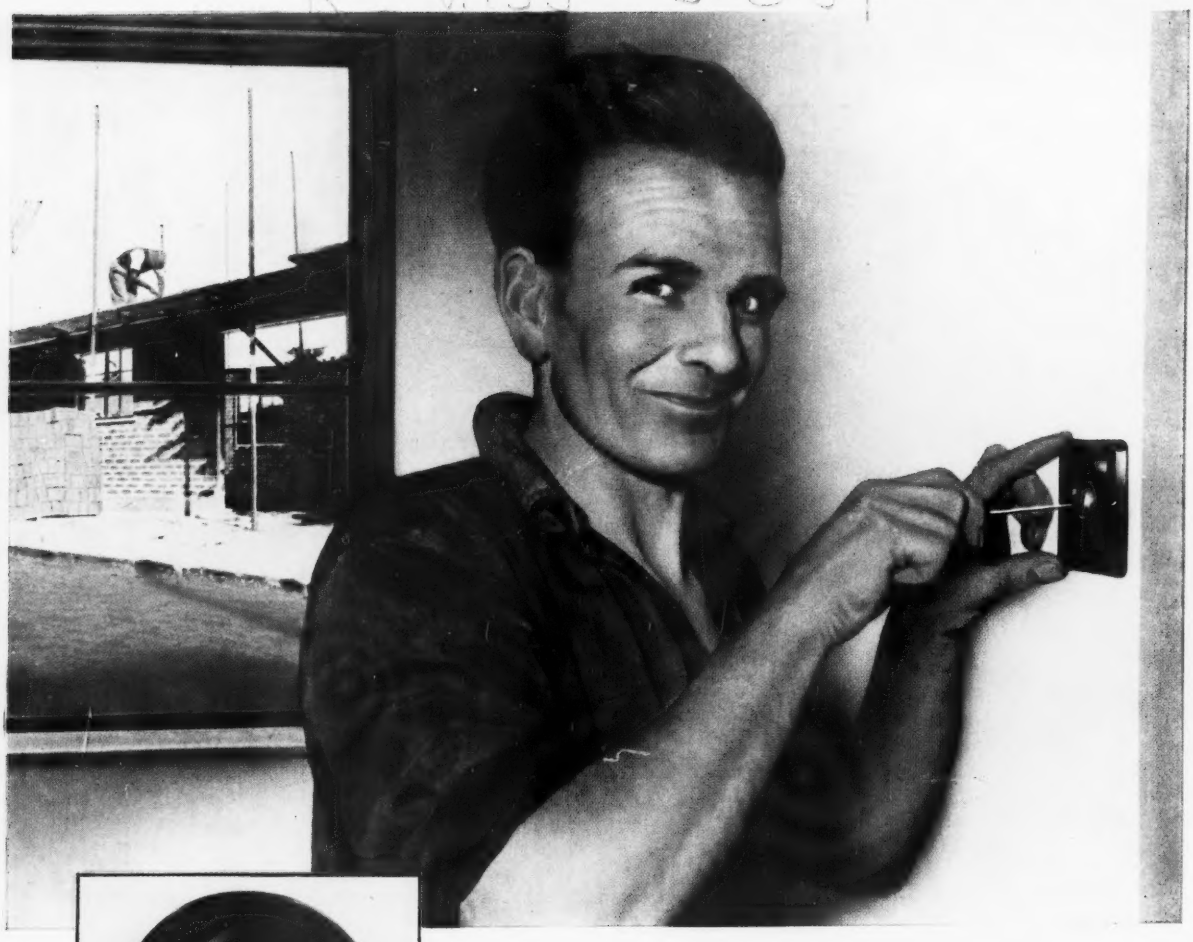

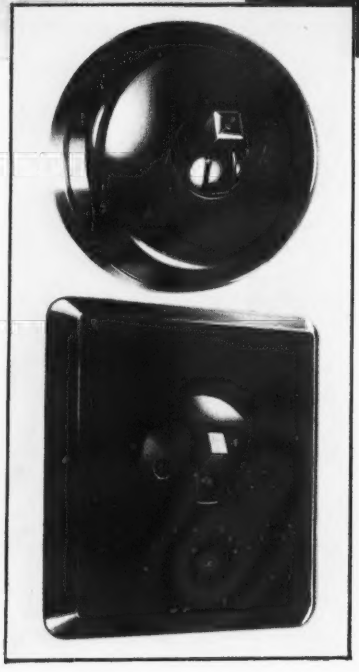

My point of view . . .

. . . is that the Avon Range of A.C. Switches has been designed with considerable thought. For instance when fitted in their plaster depth boxes they have a simple method of adjusting the switch depth whilst the switch is in position.

Points like these mean a great deal to chaps like me. They also show that apart from producing a jolly good switch at a very competitive price Ediswan Designers have given quite a lot of thought to making them simple to install.

Publication CE.1693A gives full details of the Avon range.

EDISWAN

RANGE OF ELECTRICAL ACCESSORIES

A catalogue and price list of the complete range of Ediswan electrical accessories is available on request.

E32

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155 Charing Cross Rd., London, W.C.2, and branches.

Member of the A.E.I. Group of Companies

ALL-ROUND
DEPENDABILITY
AVO VALVE CHARACTERISTIC METER
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You can depend on "Avo." When choosing instruments consult our complete catalogue, a copy of which may be had free on application.
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"Sindanyo" Natural Grade is classed as a Non-Ignitable Board under British Standard Specification 737. Supplied in the form of standard sheets 4 ft. x 3 ft. in thicknesses from $\frac{1}{8}$ in. to 3 in. It is similar to the Ebony Grade in its machining properties. Natural Grade "Sindanyo" is suitable for continuous working temperatures up to 350° C., but is frequently employed under more severe conditions of temperature under compression loading or where it may be unstressed mechanically. Natural Grade "Sindanyo" may also be treated so as to resist moisture absorption and to improve its electrical characteristics. Colour: Grey. "Sindanyo" Boards, Ebony Grade, are available for electrical insulating purposes.

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- **Attractive finish in bronze with burnished copper surround to protective grille**
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for squirrel-cage motors up to 35 h.p.

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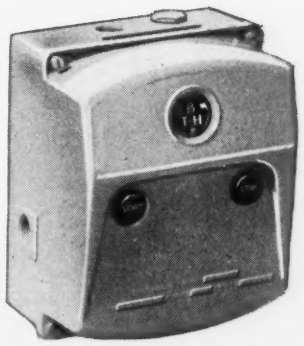
DOC 71	3 h.p.	4 h.p.	5 h.p.	5 h.p.
DOC 175	5 h.p.	7½ h.p.	10 h.p.	10 h.p.
DOC 402	15 h.p.	25 h.p.	30 h.p.	35 h.p.



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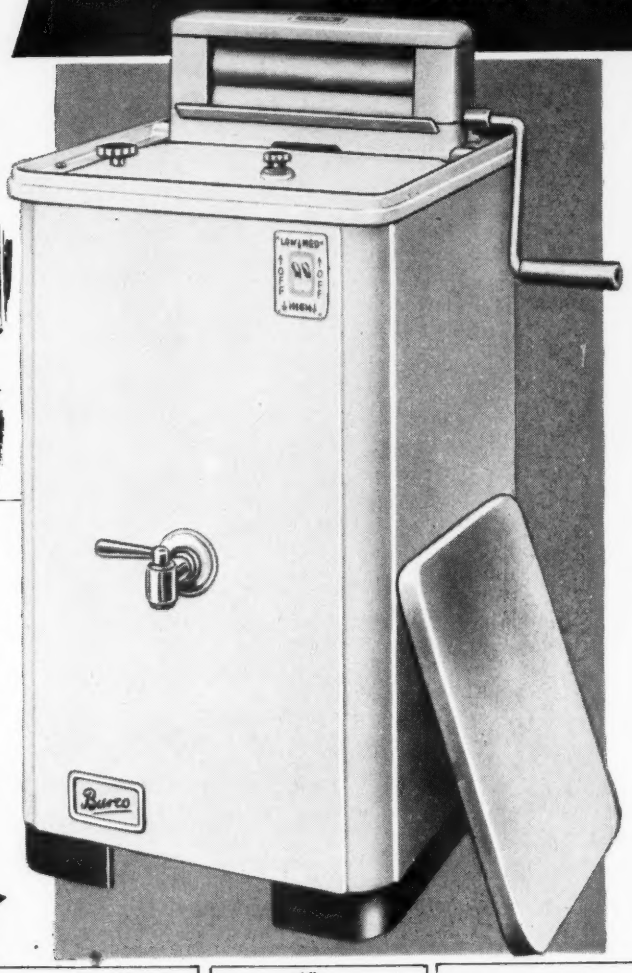
in every showroom

Burco MODEL E950
ELECTRIC WASHBOILER
WITH FOLDING WRINGER

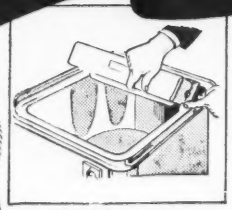


It's a positive fact the BURCO Model E950 sells on sight. Its appearance is appealing, its performance of the highest BURCO tradition—need we say more. When fitted with the BURCO Agitator Unit it becomes a complete Washing Appliance—the finest value today.

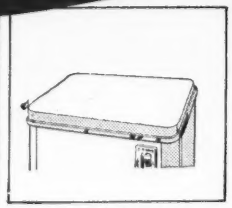
Easy to move, yet rigid in use, thanks to its fixed castors. Economical in use and in space, yet is a Family size Washboiler. . . . ***YOU CAN'T BEAT BURCO***

SUPPORTED BY BIGGER ADVERTISING THAN EVER !

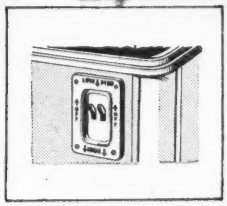
JUST A FEW OF THE BIG SELLING FEATURES



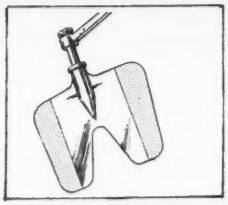
WRINGER STORAGE
The wringer can be swiftly folded inside the container and the enamelled table top makes a useful addition to kitchen equipment.



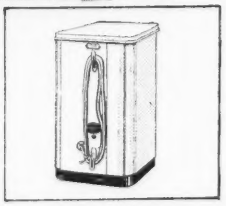
COOL TABLE TOP
of porcelain enamelled steel which enhances the appearance whilst providing additional working space.



SWITCH CONTROL
Remote switch panel of advanced design placed at working level and giving 3-heat control.



BURCO AGITATOR LID UNIT
Specially designed for the E950, it fits easily into position on the existing lid and is remarkably simple to operate.



CABLE HOUSING
There is 5ft. of external 3-core cable which is rapidly stored at the rear of the boiler when not in use.

PRICE E950 AS . . . £23 . 5 . 10

AGITATOR LID UNIT . . . £1 . 15 . 6
INCLUDING PURCHASE TAX

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in design, materials and workmanship gives Sturtevant Industrial Vacuum Cleaners the robust, long running qualities that set the standard today for industrial cleaners.

Remember — that in their 60 years' experience of air handling equipment, Sturtevant originated the turbine vacuum cleaner !—and that many years' experience of industrial cleaning needs are behind the tools and machines produced by us today.

The high quality of Sturtevant cleaners is recognised by the 48 countries to which they are exported.

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Travel

and the BALANCE OF POWER

IN THE BUSY INDUSTRIAL NORTH, trains running from Manchester to Sheffield will soon be electric. In the Southern Region, plans are well advanced for the electrification of 200 more route-miles, covering extensions from Gillingham and Sevenoaks to Ramsgate, Folkestone and Hastings. And in the Eastern Region, the Liverpool Street–Shenfield system is to be extended to Chelmsford and Southend. More plans will follow.

There are good reasons for using electricity on the railways. Electric trains are clean, powerful, fast—and they use the nation's coal resources more efficiently. Greater use of electricity for transport is good news for all consumers of electricity. Why?

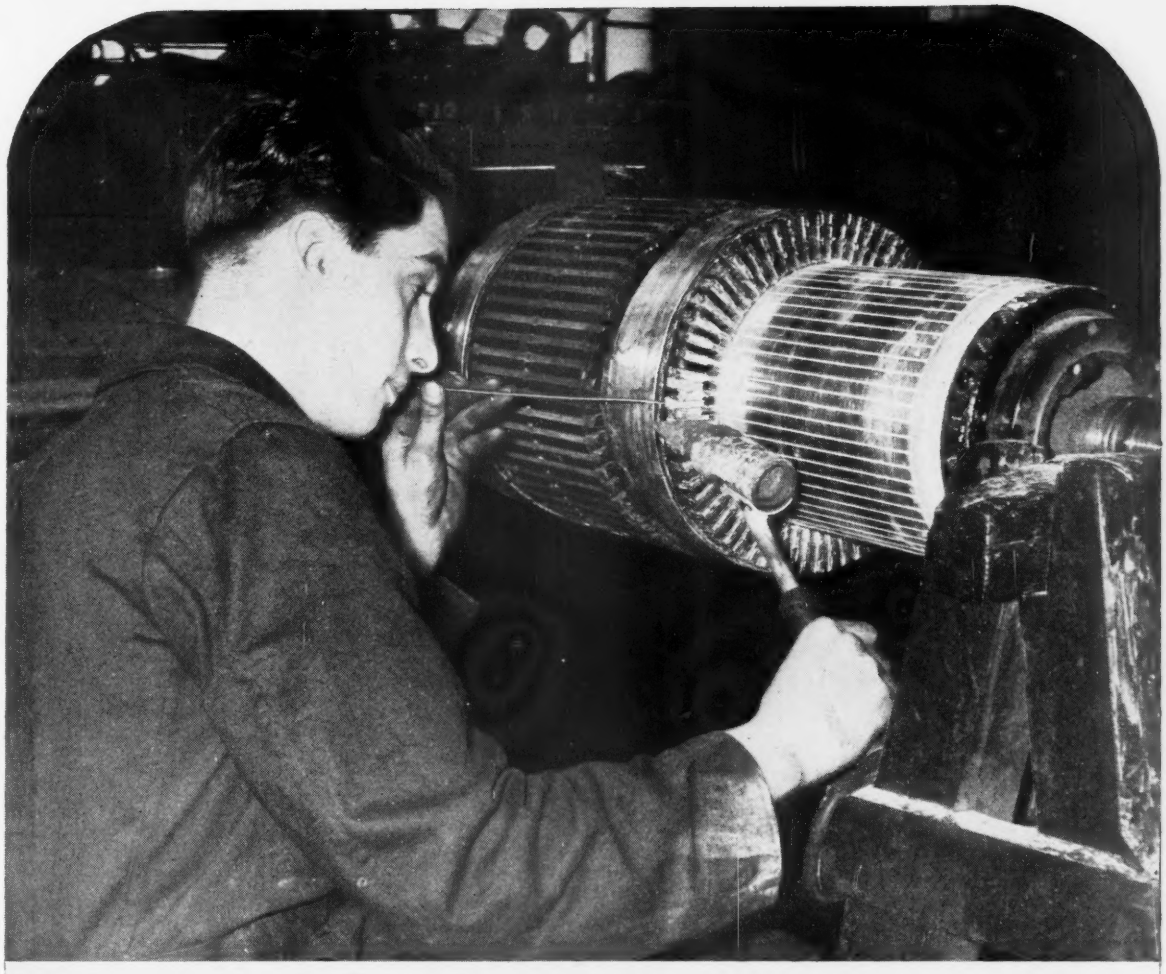
It's a matter of balance. As more electricity is used in more ways, the different loads—occurring, in the main, at different times of the day—keep the generating plant more fully employed. And continuous full output from the power stations helps to reduce the cost of electricity.

SIX YEARS' PROGRESS

BRITISH ELECTRICITY

40 NEW POWER STATIONS

50% MORE POWER



"An armature is as strong as its weakest joint—only skilled soldering can be afforded in this operation."

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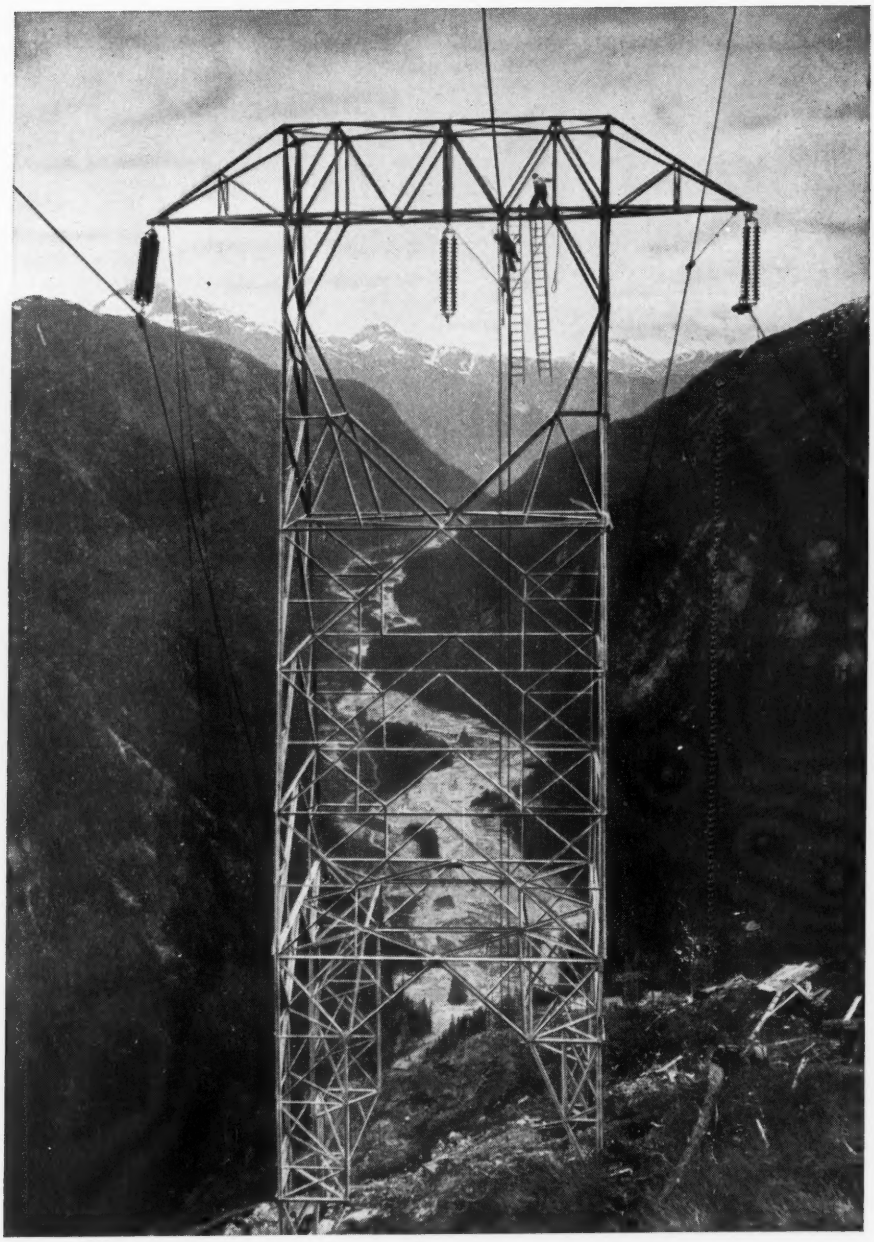
aluminium adventure



power climbs over A PASS

High above the steep sides of the Kemano valley, British Columbia, engineers handle aluminium cable, steel reinforced, 2.26 ins. in diameter—the largest ever made.

This unique transmission line, designed to withstand heavy icing loads, carries the 300,000 volt output of the Kemano underground power station across fifty miles of rugged terrain and over the 5,300 ft. Kildala Pass. To mountain sites inaccessible to all other forms of transport, helicopters have flown-in materials and equipment for the transmission towers which take the power over the pass to Kitimat.

There, on the shores of the Douglas Channel, the great new smelter of Aluminum Company of Canada Ltd. is now in operation. When fully developed it will be capable of producing 500,000 metric tons of aluminium a year, and will play an important part in making aluminium and its alloys ever more abundantly useful.

Aluminium Union Limited

(Incorporated in Canada)

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PRINCIPAL BRITISH COMMONWEALTH DISTRIBUTOR OF ALUMINIUM

FERRANTI

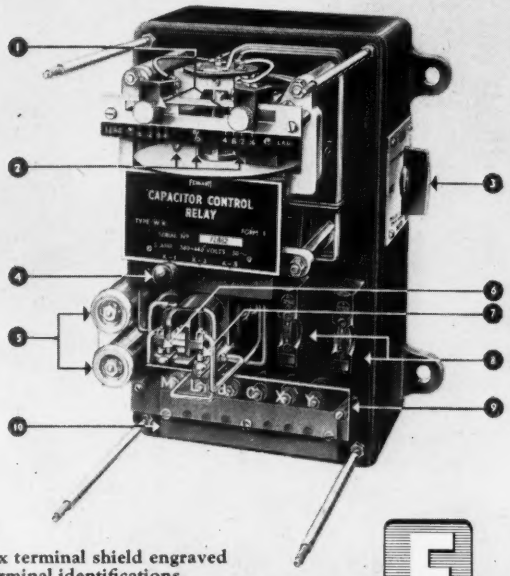
CAPACITOR CONTROL RELAY

(TYPE WR)

FOR SINGLE STAGE CONTROL

This relay provides *automatic power factor correction* when used with suitable capacitors.

- Independently adjustable "lead" and "lag" settings over a wide range.
- Self-contained auxiliary element with substantial contacts to operate the heavy duty capacitor contactor.
- Selector switch to give automatic or manual control as required.



1. Independently adjustable settings for "lead" and "lag".
2. Contacts operated by movement of disc.
3. Switch for auto/manual control.
4. Settings multiplier change plug.
5. Limiting resistors in series with auxiliary relay coil.
6. Auxiliary Relay—main contacts for capacitor control.
7. Auxiliary Relay—"Hold-on" contacts.
8. Fuses.
9. Perspex terminal shield engraved with terminal identifications.
10. Dust-tight entries for wiring to terminals.

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Heating Elements wound on Mica, Porcelain, Asbestos
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THE CRESSALL MANUFACTURING CO. LTD.
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Know your Goods!

These facts sell the G.E.C. Cooker

Easy to use, easy to clean.

Large oven, fitted with counter-balanced drop-down door, can accommodate 18 lb. turkey.

Ovenmaster illuminated dial control simplifies and supervises all oven cooking.

Warming drawer in base warms plates and dishes.

Simmerswitch gives thermostatic control for boiling and steaming.

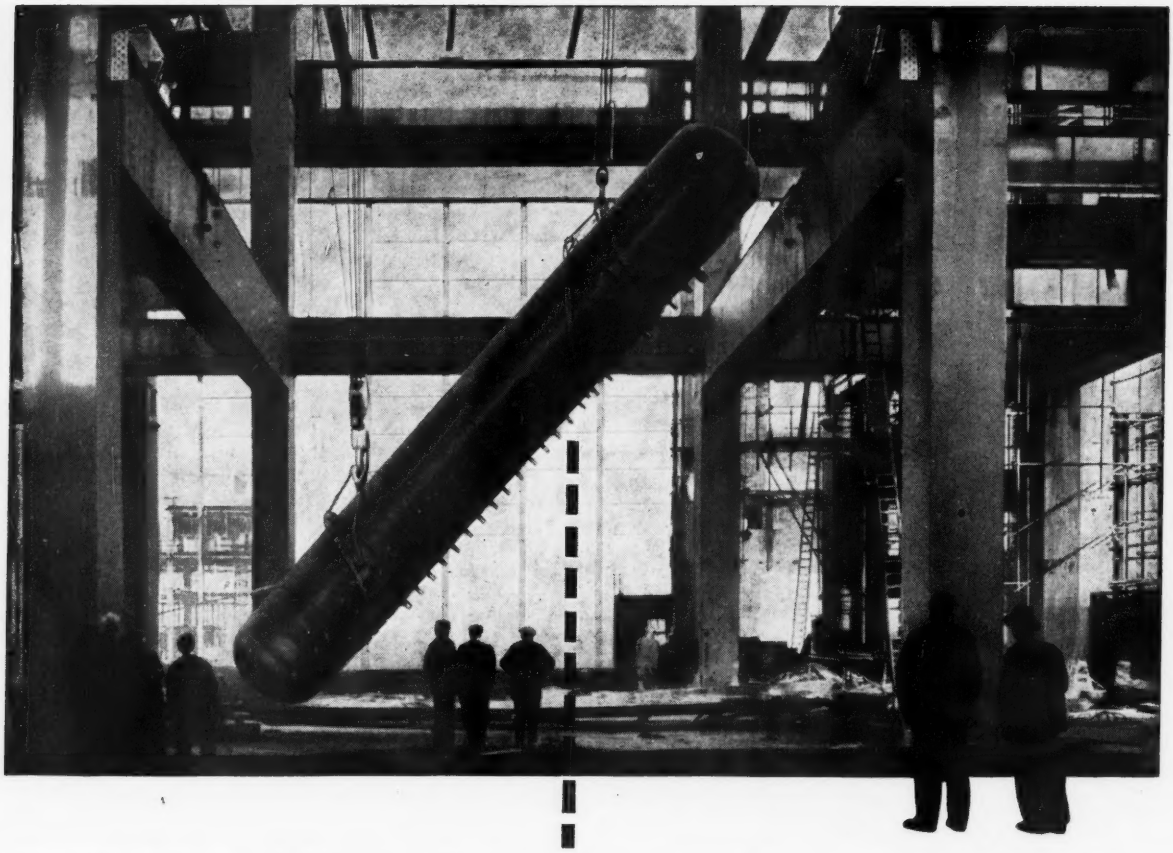
Extra large warming cupboard keeps food hot.

Beautiful modern appearance, sparkling finish — several colour combinations.

Retail Price £37 · 12 · 6 *Tax Free*

Tell your customers about the G.E.C. Cooker DC114

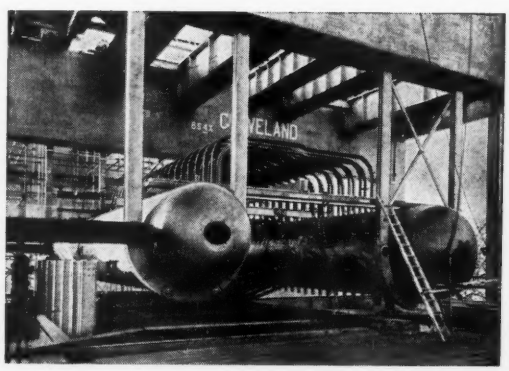
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



ERECTION at STELLA

Stella South Power Station, now under construction on the banks of the River Tyne, will be provided with units of 550,000 lbs. per hour steam capacity, generating at a pressure of 950 p.s.i. with a final temperature of 925°F. The boilers are of the radiant heat type and are designed to be fired by four Raymond Bowl Mills.

Auxiliary equipment will comprise air heaters, electrostatic precipitators and mechanical draught plant. Stella North Power Station is being provided with similar Clarke, Chapman units.



Photographs show one of the main drums (63 tons) being lifted and two boiler drums in position. Photographs by courtesy of the British Electricity Authority.

Consultants — Messrs. Merz & McLellan.

WATER-TUBE BOILERS BY

Clarke Chapman

CLARKE, CHAPMAN & CO., LTD., Victoria Works, Gateshead on Tyne, 8, Co. Durham
Telephone: Gateshead 72271 (10 lines) *Telegrams: "Cyclops" Gateshead*
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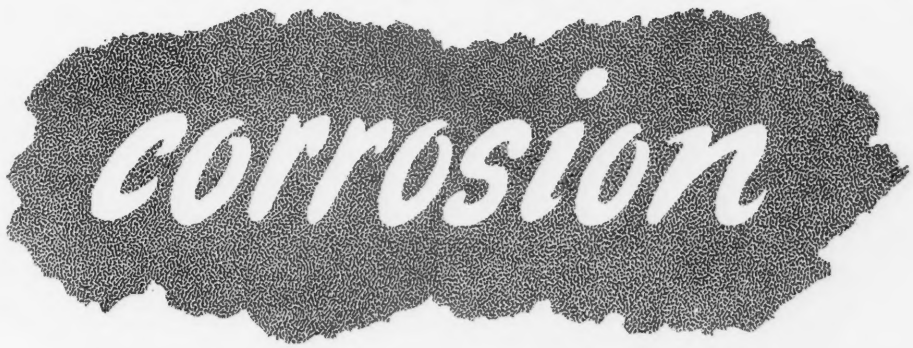
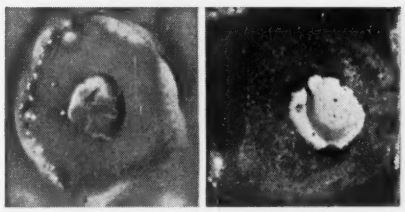
ALCHO-RE Fluxes eliminate



The use of FRY'S Alcho-Re soldering products guarantees swift, perfectly soldered joints *with no corrosive after-effects.* Alcho-Re fluxes contain active constituents which, whilst ensuring fast, even solder-spread, eliminate entirely the dangers of dry or H.R. joints. For complete freedom from corrosion in all forms of soldering specify ALCHO-RE—by FRY'S. Export enquiries invited.

HERE'S THE PROOF



LEFT. Residue from Alcho-Re flux on soldered copper, shows no change *after three months' storage.*
RIGHT. Corrosion and deliquescence are visible on the specimen soldered with an active flux *only three days after soldering.*

The Alcho-Re Range of Products include

PASTE FLUXES
SOLDER CREAMS
CORED SOLDER WIRES
SOLDERING FLUIDS

All conforming to Specification DTD599

FRY'S Metal Foundries Limited

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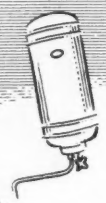
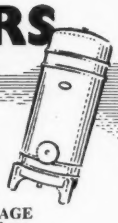
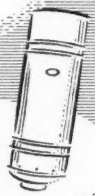
The SANTON range of domestic thermal storage WATER HEATERS



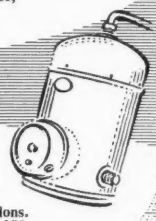
NON-PRESSURE TYPE (N.P.T.)
APPLICATION : For supplying hot water to one point or by means of a swivel swan-neck to two adjacent points. Wall fixing only.
CAPACITIES : 1½, 3, 5 and 12 gallons.
VOLTAGE RANGE : 200/220, 230/250.



PRESSURE TYPE (P.T.F.M.)
APPLICATION : For supplying hot water to two or more points by plumbing to standard tap. CAPACITIES : 20, 30, 50 and 100 gallons floor mounting, also 5, 12, 20 gallons wall mounting. VOLTAGE RANGES : 200/220, 230/250 single phase, 348/380, 400/440, 3 phase.



CISTERN TYPE (D.F.)
APPLICATION : For multipoint service where no existing cistern is available. CAPACITIES : 5, 12 and 20 gallons wall mounting, and 20, 30, 50, 100 gallons floor mounting.
VOLTAGE RANGES : 200/220, 230/250, 348/380, 400/440, 3 phase.



PRESSURE TYPE (P.T. 2½ Fm)
APPLICATION : Installed beneath sink, hand-basin or bar-counter it provides a constant supply of hot water for domestic use or glass-washing. CAPACITY: 2½ gallons.
VOLTAGE RANGES : 200/220, 230/250.
Also available as non-pressure type.

Full particulars from : **SANTON LTD NEWPORT · MON**

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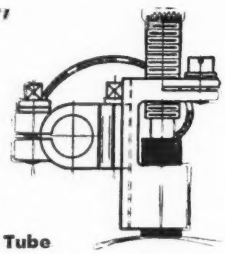
"WESTMINSTER" Brush Holders



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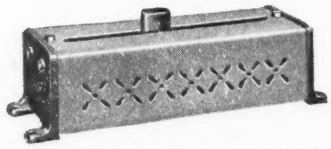

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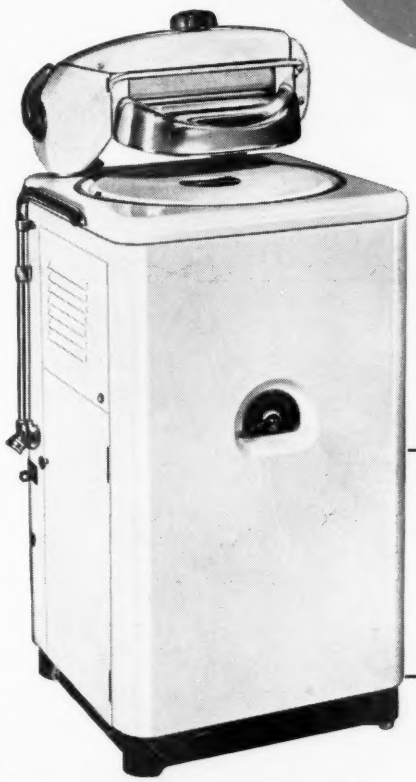

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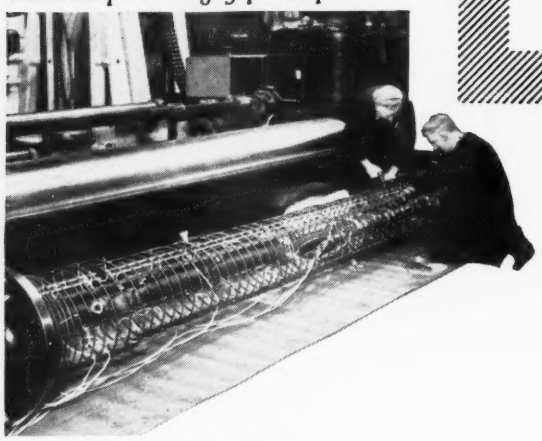
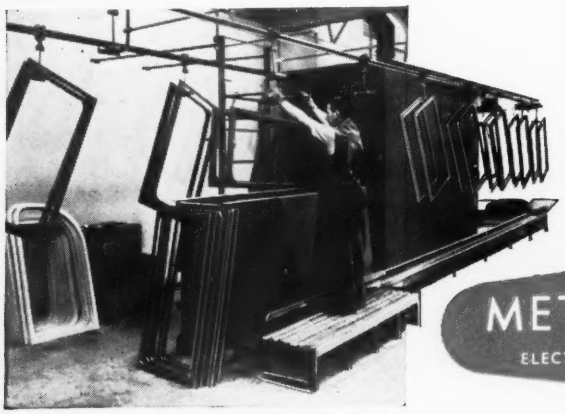


Tubular-element Roller Heater.



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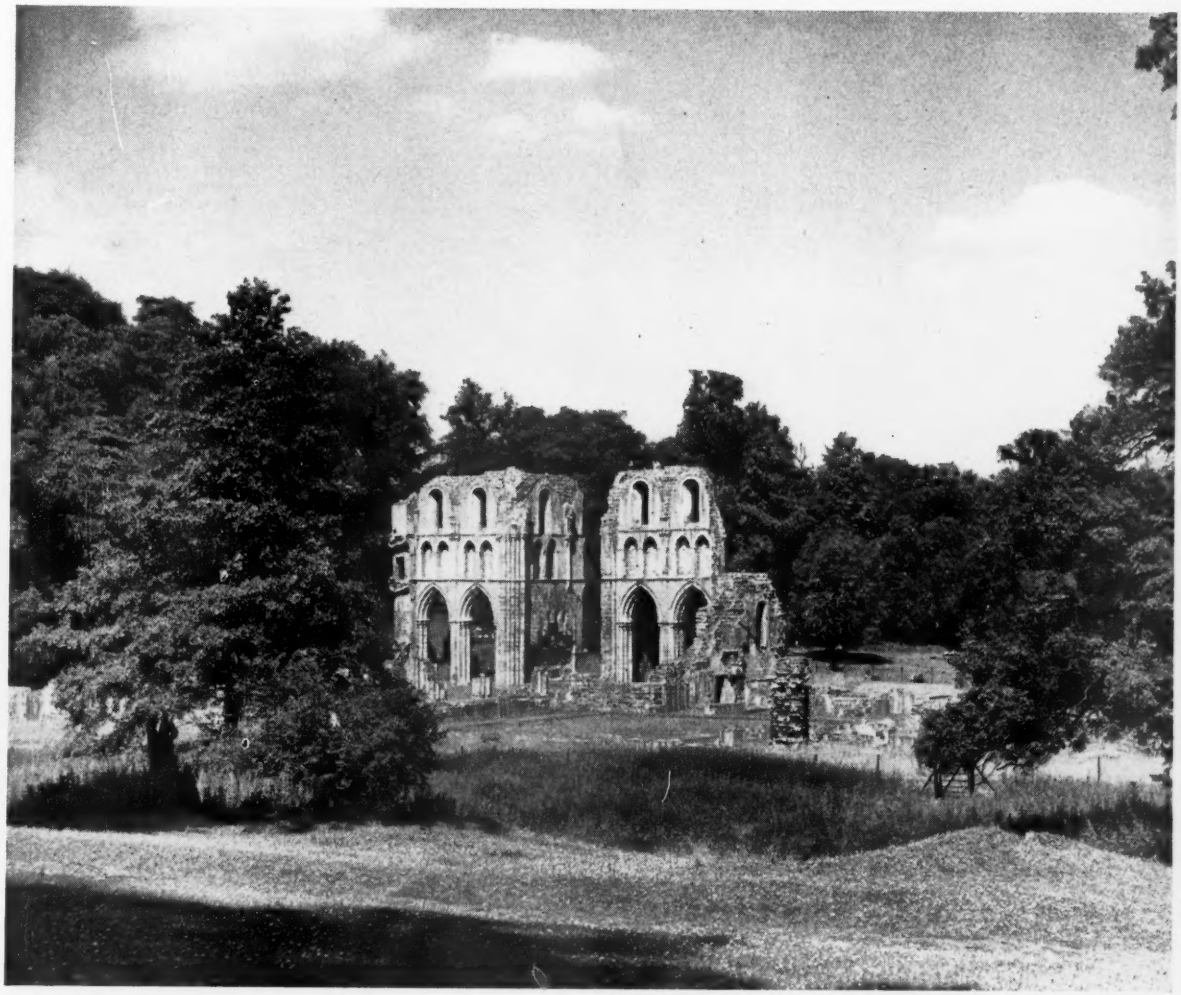

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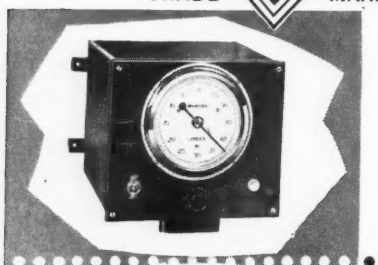
for Industry



TYPE ASR

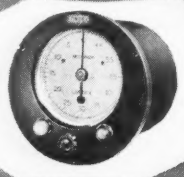
A first-class timing instrument, with an auto-reset device. Suitable for remote or automatic control. Scale ranges from 1 minute to 72 hours.

TYPE SRJ

A smaller timer than the ASR; suitable for manual start, but incorporates auto-reset. Scale range from 1 minute to 24 hours.

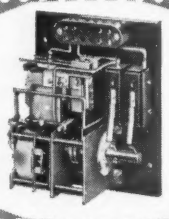
TYPE SRJ/EMC

Similar to SRJ, but fitted with clutch for remote control.



TYPE RFT

This timer incorporates features of both SRJ and ASR types, but in a circular casing for flush mounting. 20 various scales for 10 seconds to 3 days.

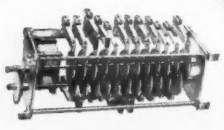


TYPE ROY

The dial of this timer is enclosed and the unit is suitable for repetition work where the time interval is changed infrequently. The unit has an electro magnetic clutch.

TYPE VM/TS

Fixed cycle timer with variable on/off period. Switching by 10 amp. mercury switch. Time range from 1 minute (1 second divisions) to 24 hours.



TYPE PR

Multi-circuit timers for sequence control. Contacts operate at fixed times by means of cams driven by an A.C. synchronous motor. Timers can be built to customers' specification with up to 30 cams.

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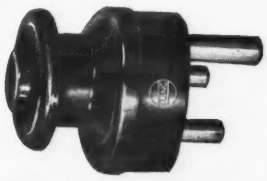

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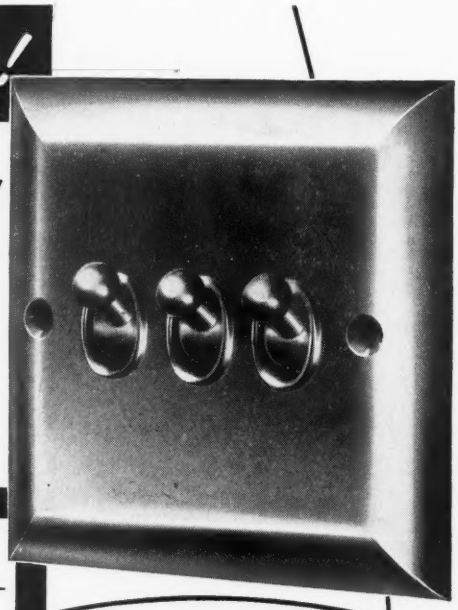

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What is your present tariff based on? (Tick those that apply)

kVA Maximum Demand .....

kW „ „ .....

★Unit charge only.....

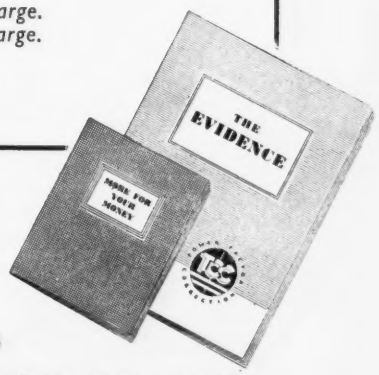
Is there a power factor penalty clause?

If so, what is it?.....

If you know your present power factor, please state what it is.....

★*Note: this applies to tariffs without any Maximum Demand charge. All M.D. tariffs have in addition a running unit charge.*

If we consider that we can show you a saving, we will make a survey free of charge or obligation.



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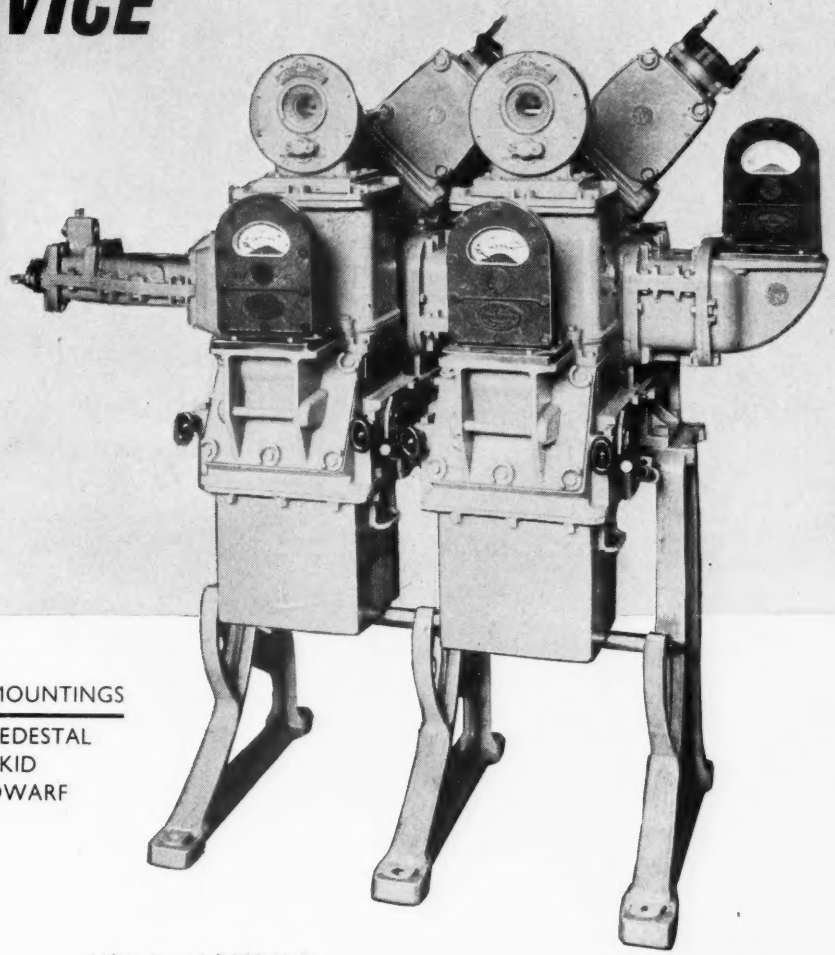

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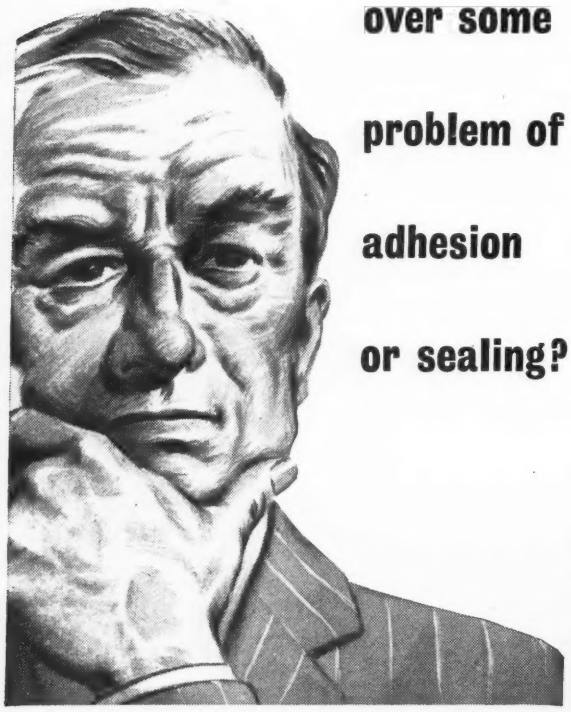

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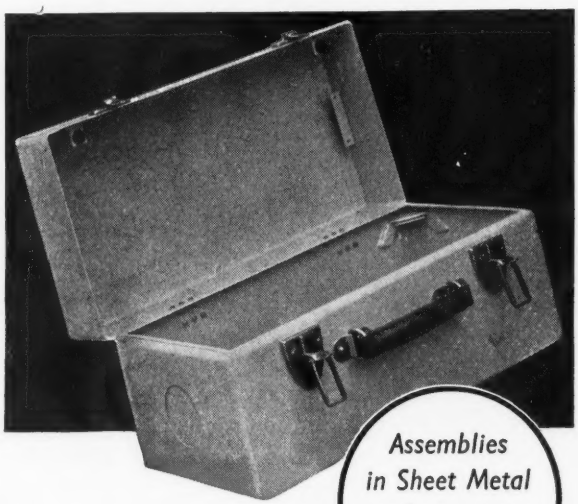

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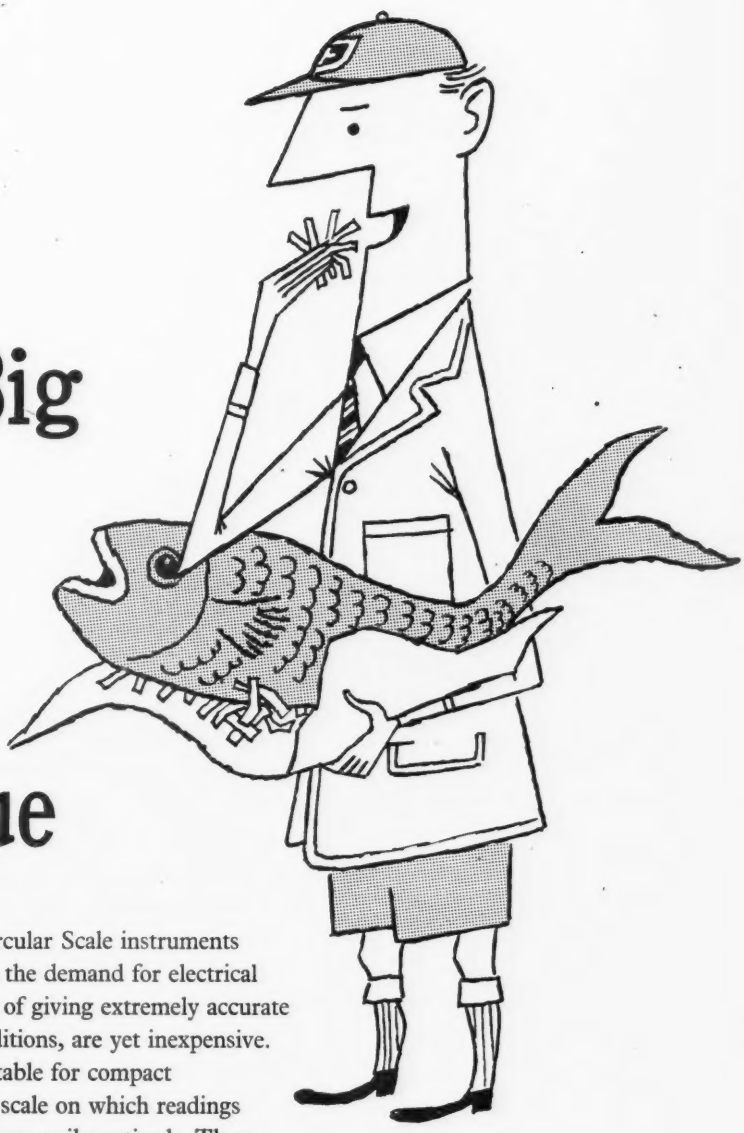

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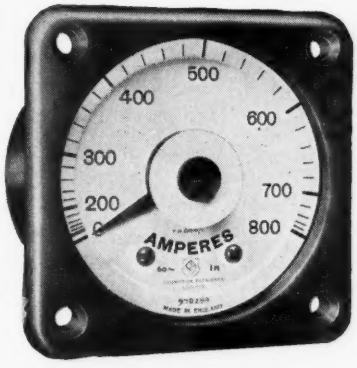

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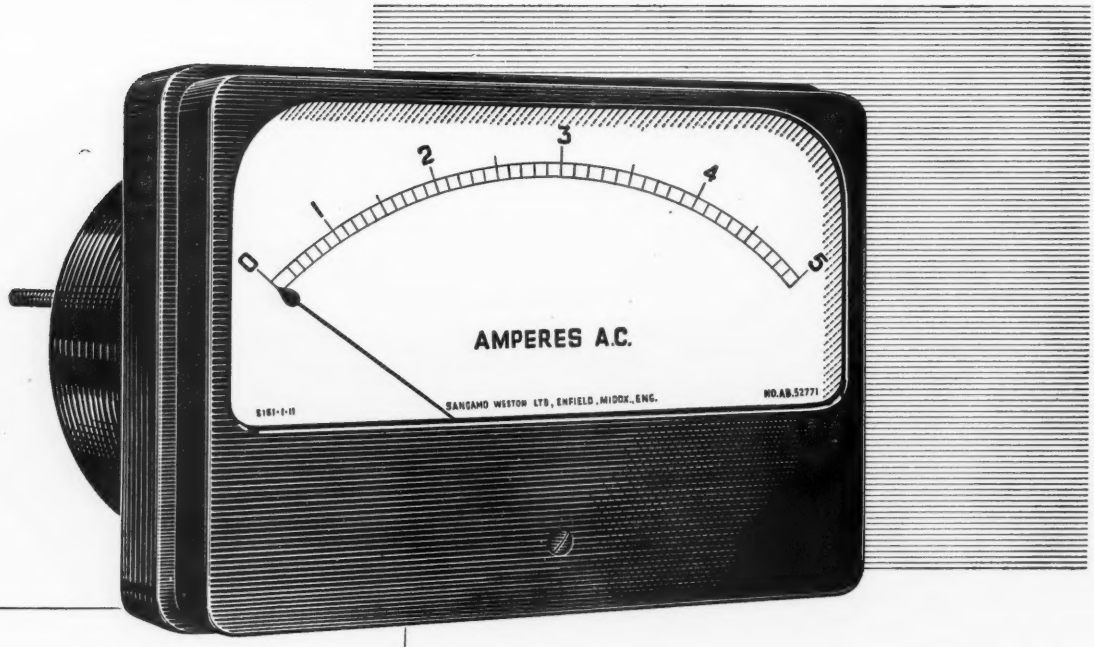

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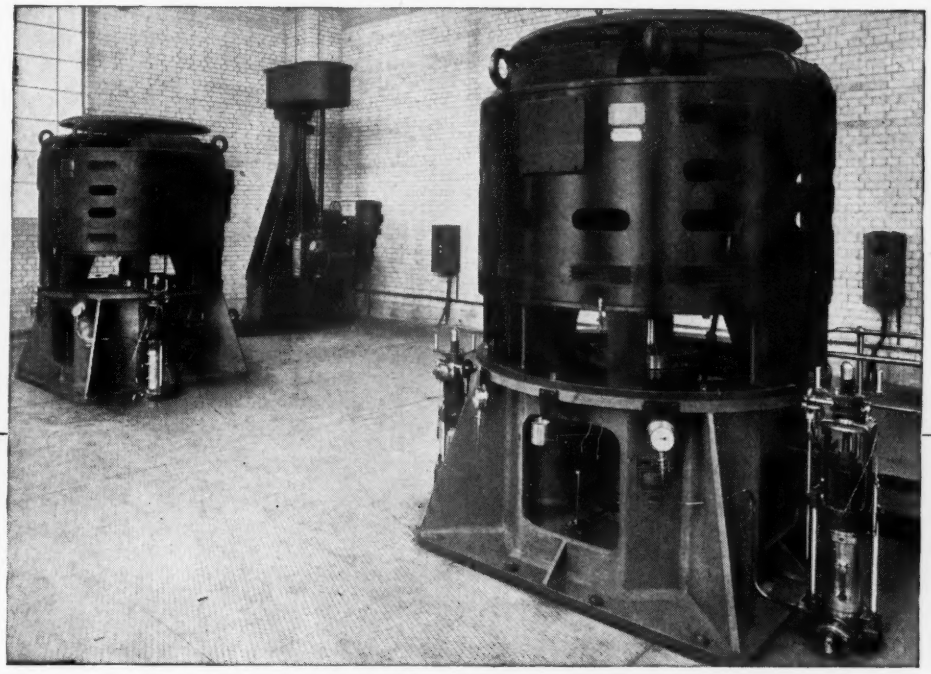
Drives for power station auxiliaries



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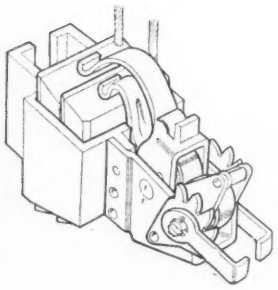

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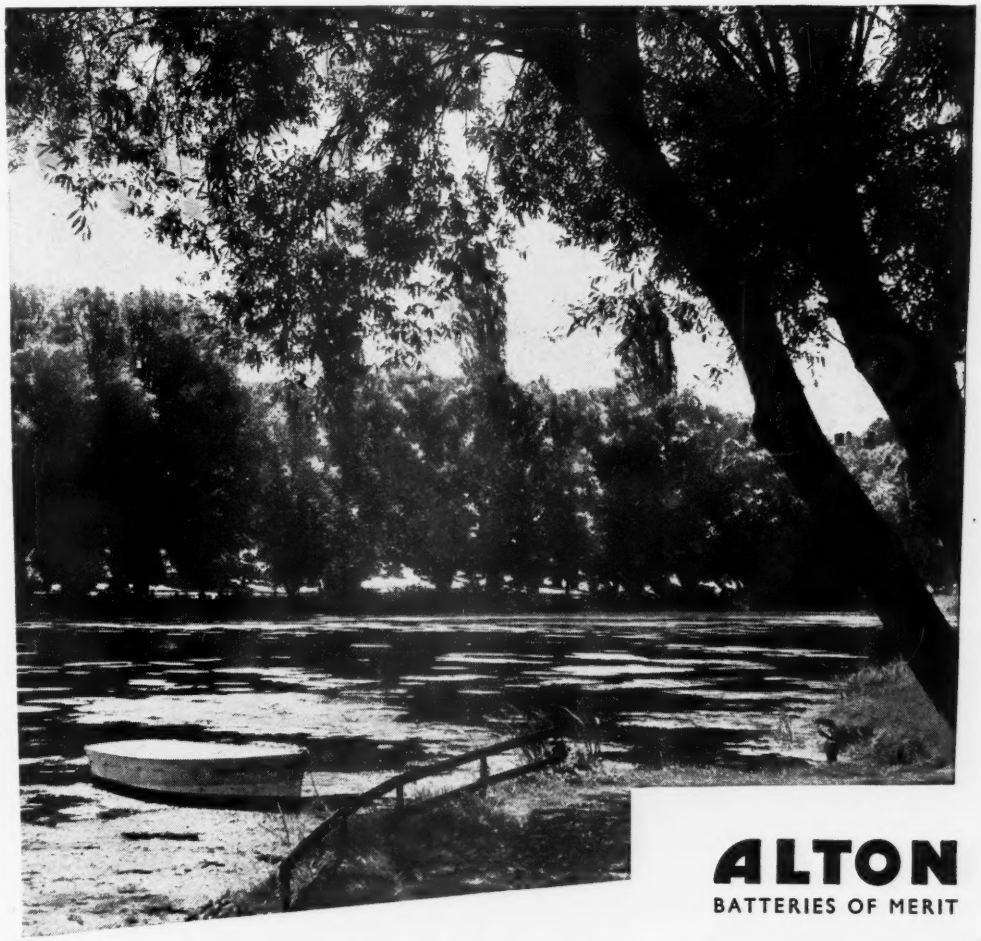
This is King's Pond— and its waters almost lap the bricks of the Alton Battery Works' south-west wall. It is part of the Company's property—a 5-acre asset in real estate. And a symbol of assets in wider terms than accountancy covers. Alton is a country town—with a full, rounded, contented life of its own. A town where people have not yet changed to personnel. A town where families take root—and son follows father up to the Battery Works. A place where a man's proper pride in himself and his folk and the life he leads is reflected in doing things just that all-important bit better than 'up-to-specification.' And Alton batteries are made by Alton men



ALTON
BATTERIES OF MERIT

Alton stationary batteries: 10 to 15,000 Ah. Also in regular production, renewal plates for all makes of battery, British and Continental.

A24A

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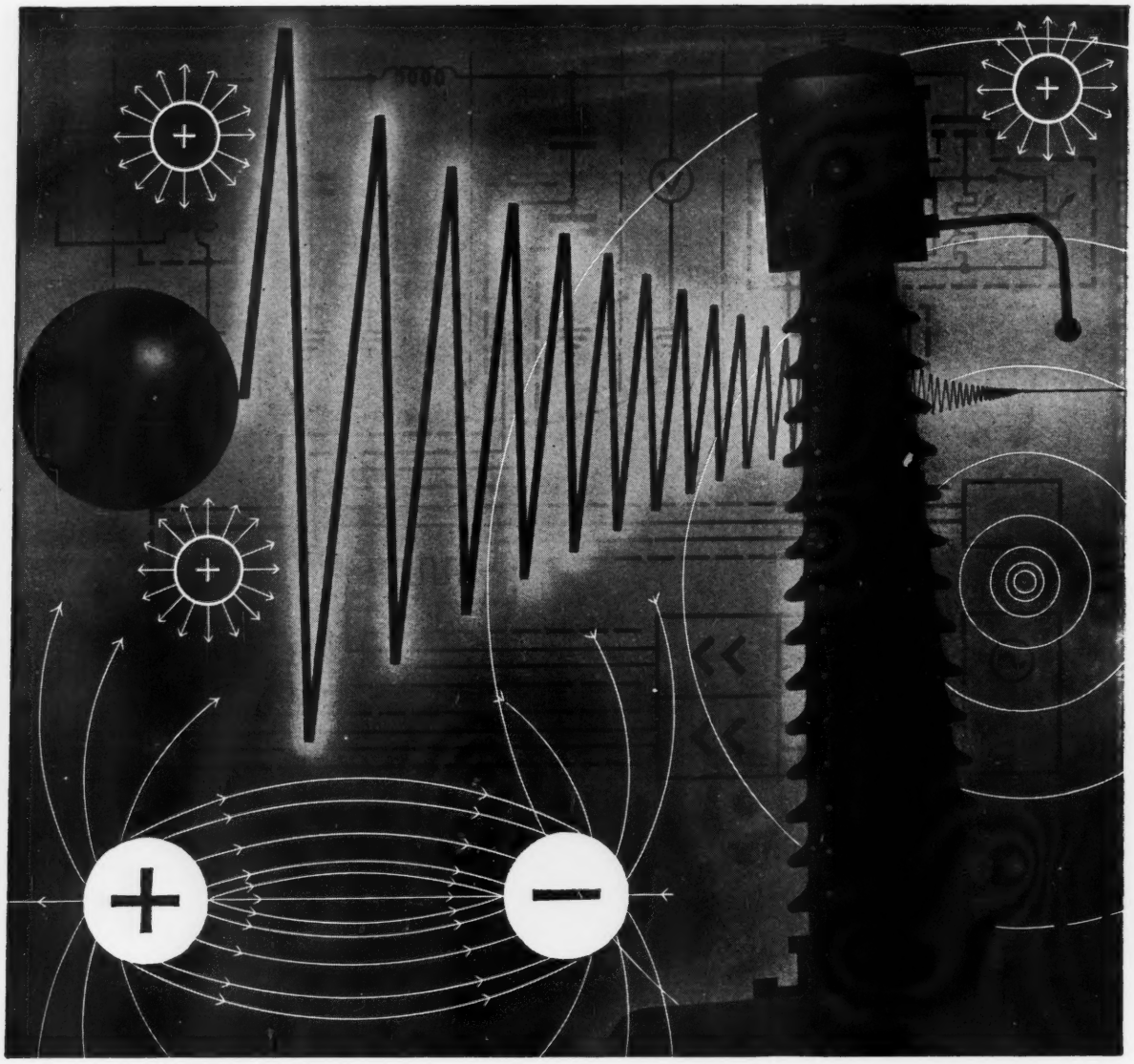


Splendid Insulation

The making of insulating oil is one of the most delicate jobs in the refinery. The slightest particle of foreign matter, the minutest droplet of moisture must be detected and abstracted before the oil can be considered suitable for use in transformers, switchgear and capacitors.

In developing the purest insulating oils, Shell have brought research precision to the actual refining processes. And this close link between research and practice is maintained all the time because Shell believe that even the best can be bettered.

There are standard tests for insulating oil but for Thornton these are only the beginning. There is, for instance, a test for each specification to ensure minimum deterioration over a fixed time. By prolonging these tests Shell have learnt much of practical value about the deterioration/time relationship.

Two Shell experts designed and built a vacuum pre-treatment apparatus for filtering, dehydrating and degassing oil. This enabled them to assess in the laboratory what the properties of the oil would be when the user had applied similar pre-treatment on a big scale in practice.

Another Thornton special is a test in which oil is forced to oxidise rapidly to assess its lasting properties. This is only one of a number of oxidation tests which produce in a matter of weeks the effects of years of operation under the severest practical conditions.

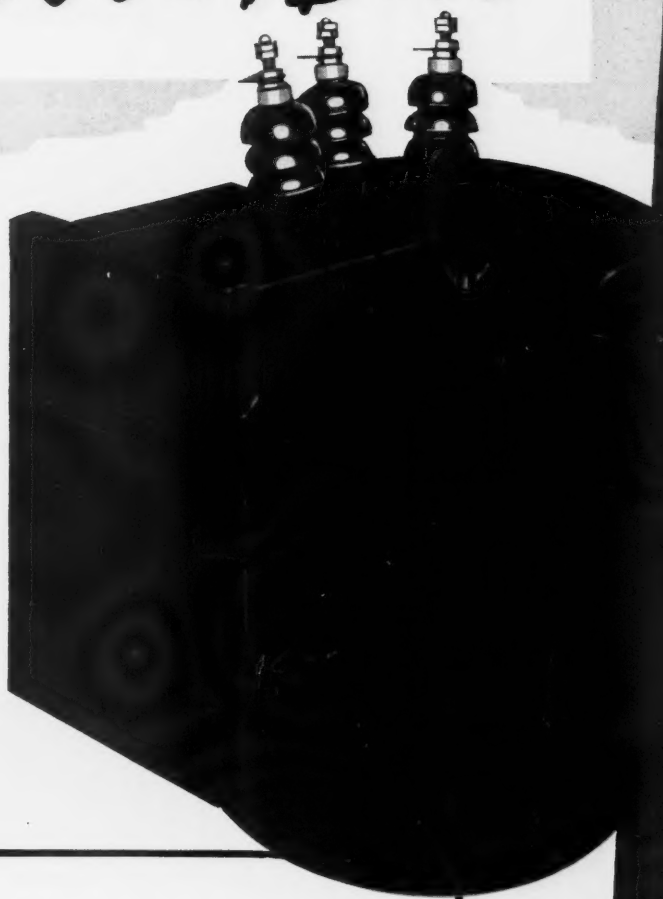
Shell's specialised research work is continuous, thorough and wide-ranging. It is the background to Shell leadership in electrical oils.

Shell's laboratories at Thornton, Cheshire, cover an area of 800,000 sq. ft. and are manned by a staff of over 800—that's how Shell makes sure.

SHELL

LEADERSHIP IN LUBRICATION

A NEW CONCEPTION IN LINE BOOSTERS

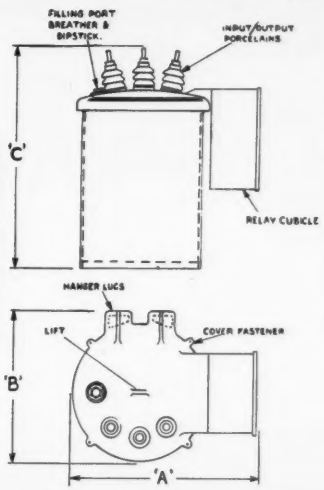


THE BRENTFORD Tail-End Booster represents a completely new conception in line boosters, making available a cheap reliable unit for rural distribution networks.

It provides the most economical means of maintaining rated voltage to the consumer, ensuring maximum efficiency and performance from lamps, motors, radio, television, electric fires, and other equipment on the system.

Designed as a single phase unit, it is suitable for single phase supply or banked in star to provide independent control of each phase of a 3-phase 4-wire system.

Approximate overall dimensions and shipping specifications



Through put kVA	DIMENSION A	B	C	Approx. Net Weight
5	18½ ins	13½ ins	23 ins	150 lbs
10	18½ ins	13½ ins	28 ins	190 lbs
15	18½ ins	13½ ins	36 ins	250 lbs
20	18½ ins	13½ ins	44 ins	310 lbs

Through put kVA	DIMENSION A	B	C	Approx. Net Weight
5	47 cm	34.4 cm	58 cm	69 Kg
10	47 cm	34.4 cm	71 cm	87 Kg
15	47 cm	34.4 cm	91 cm	114 Kg
20	47 cm	34.4 cm	112 cm	142 Kg

Send for fully descriptive leaflet

BRENTFORD TRANSFORMERS LTD.

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- Prices are *most* competitive
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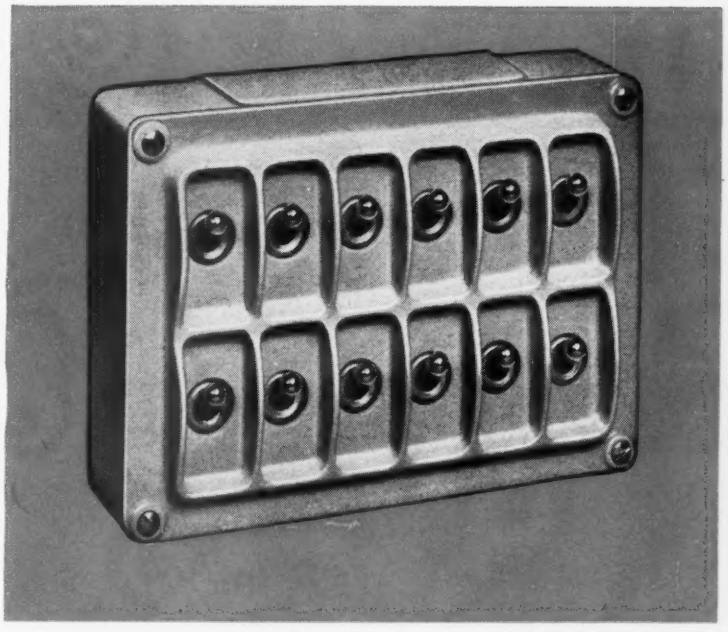

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INDUSTRIAL LIGHTING UNITS

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Various lengths of arm (maximum horizontal reach 54 in.). With pillar or short vertical pivot. Six sizes of reflector. Bases for wall, bench, ceiling, floor or for mounting direct on machines. Also portable types.

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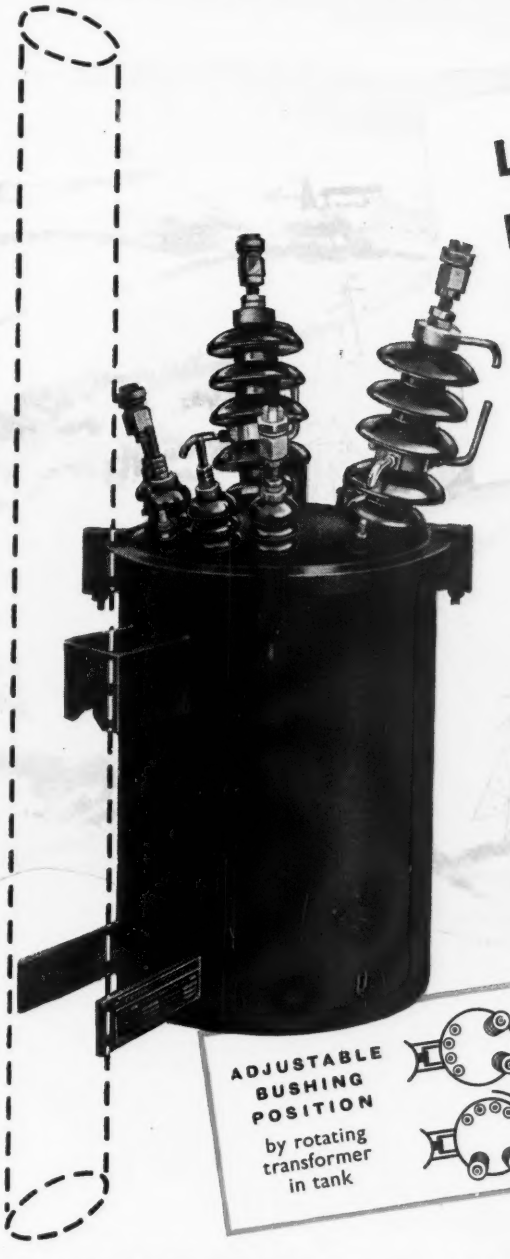
S30

FOSTER

POLE-MOUNTED

FRUGAL TRANSFORMERS

Cut the Cost of Rural Distribution



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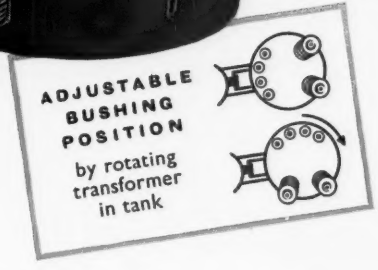

- 5 and 15 kVA—6.6 kV or 11 kV
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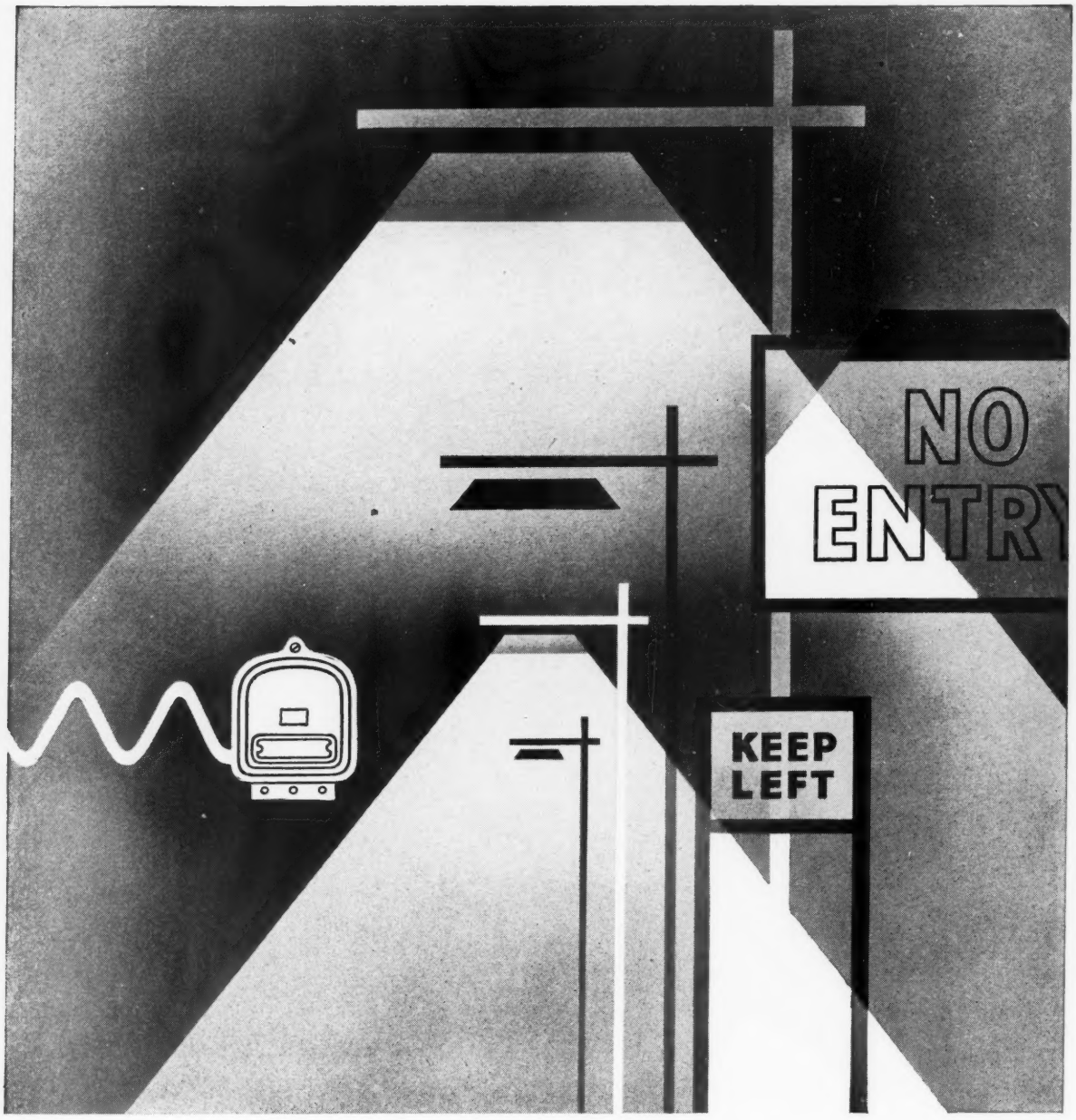

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" Rythmatic " ripple control gives the street lighting engineer personal control of the whole network. He can exercise this control at any time and select the signals he wants for particular requirements, *i.e.*, all-night, half-night and prior-dawn switching. All selected lamps are switched simultaneously and the operation of the control switches is unaffected by chance interruptions of the electricity supply. For the services available " Rythmatic " ripple control is the most economical system and it is sufficiently flexible to fulfil all the requirements likely to be met in practice.

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Vybak Products Include: Rigid and flexible PVC compounds for moulding and extrusion; calendered sheet; rigid and flexible pressed sheet—coloured, transparent or translucent; heavy grade industrial rigid sheet; Polymer and Copolymer resins.

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Compounds

C4

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Once again KINGS have made a fundamental contribution to overhead conveying technique. The new fully patented 'STANRUN' conveyor gives a means of production control hitherto unobtainable by any other conveyor system.

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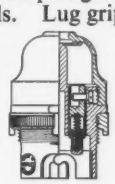
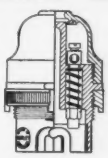
SPRING PLUNGERS

Terminals stationary during lamp insertion or removal.





SOLID PLUNGERS

Terminals move during lamp insertion or removal.

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Spring or solid plungers. Has effective cord grip. One type lamplocking, key operated.

CORD GRIP "DREADNOUGHT"

Heavyweight, with porcelain interior, solid plungers, non-rotating cap, and effective cord grip.

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Spring or solid plungers. Choice of six threads:—
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Spring or solid plungers. With screwed bush and grommet, to grip 14/.0076 round twin T.R.S.

BATTEN

Spring plungers. Easily wired body removes from base rear. 2" fixing centres. Available with "loop-in" third terminal.

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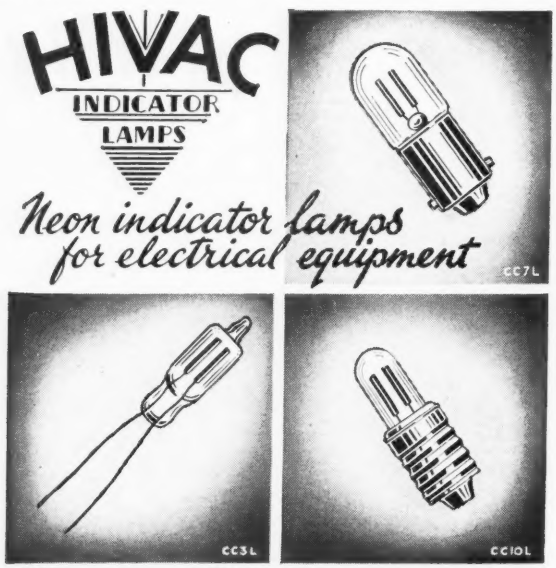

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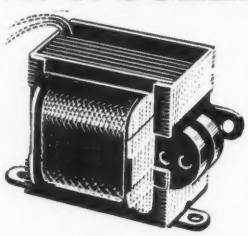

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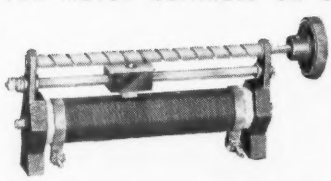

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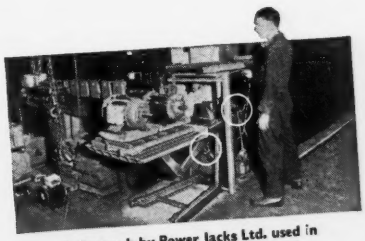
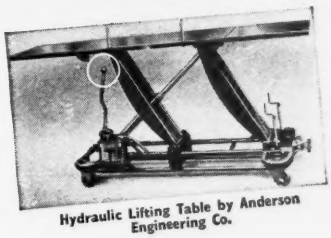


Hydratruck by Power Jacks Ltd. used in conjunction with gravity conveyor

Hydratruck by Power Jacks Ltd., London



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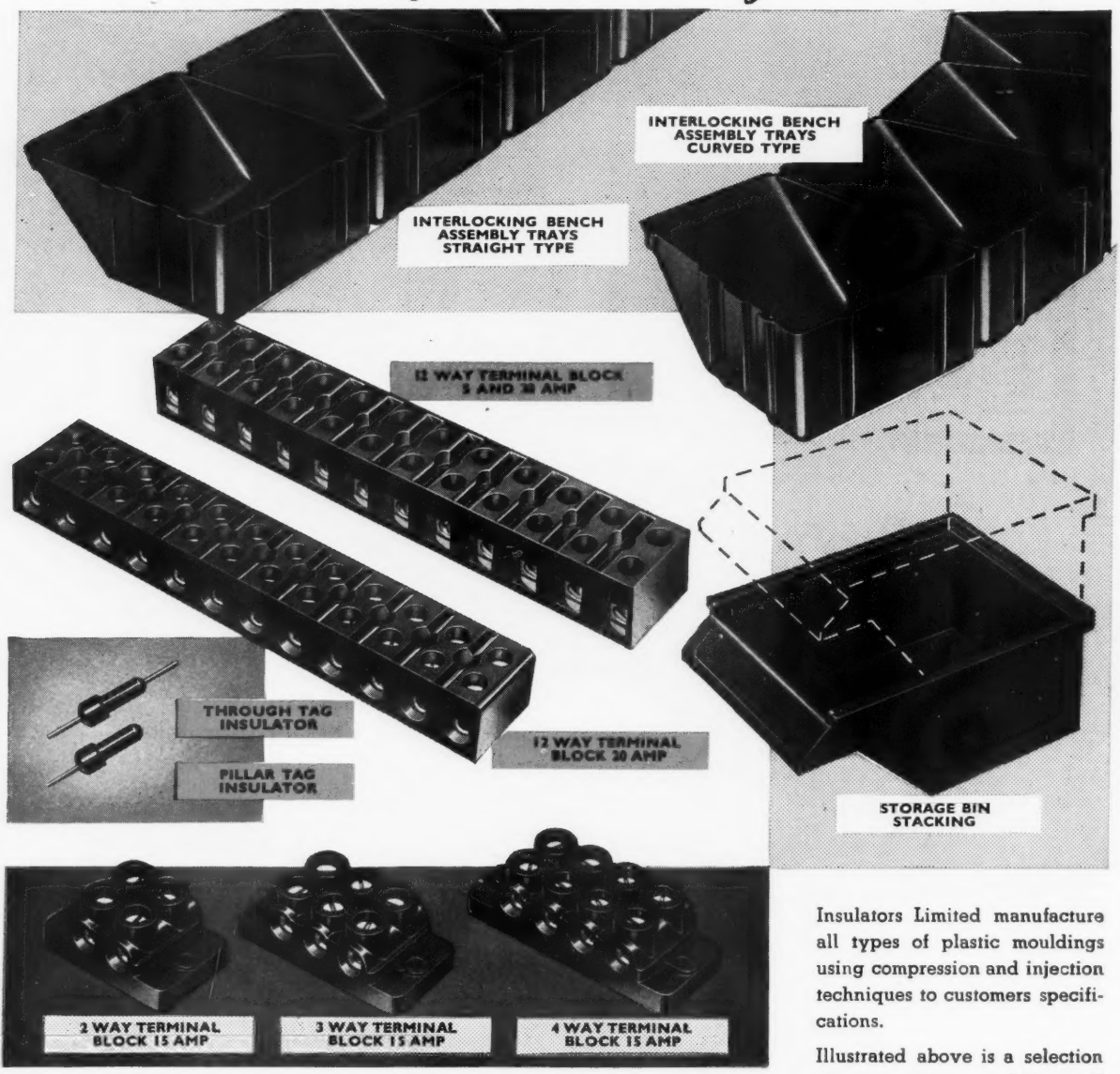
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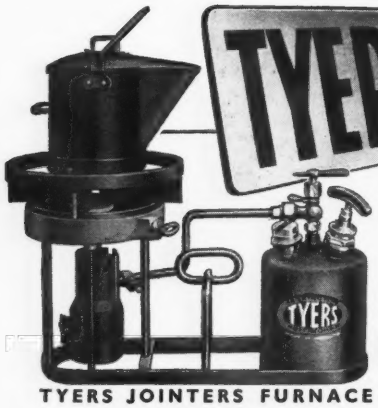

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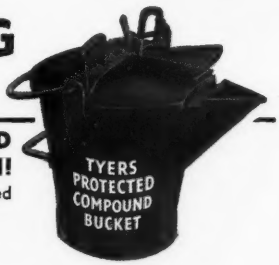

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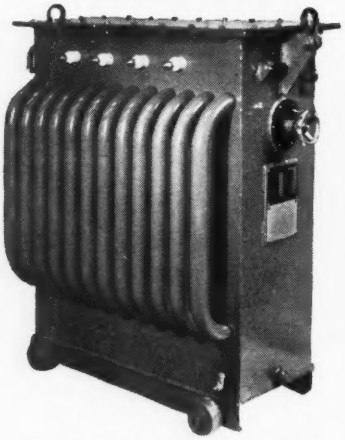

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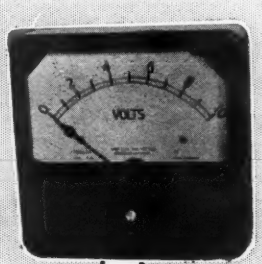

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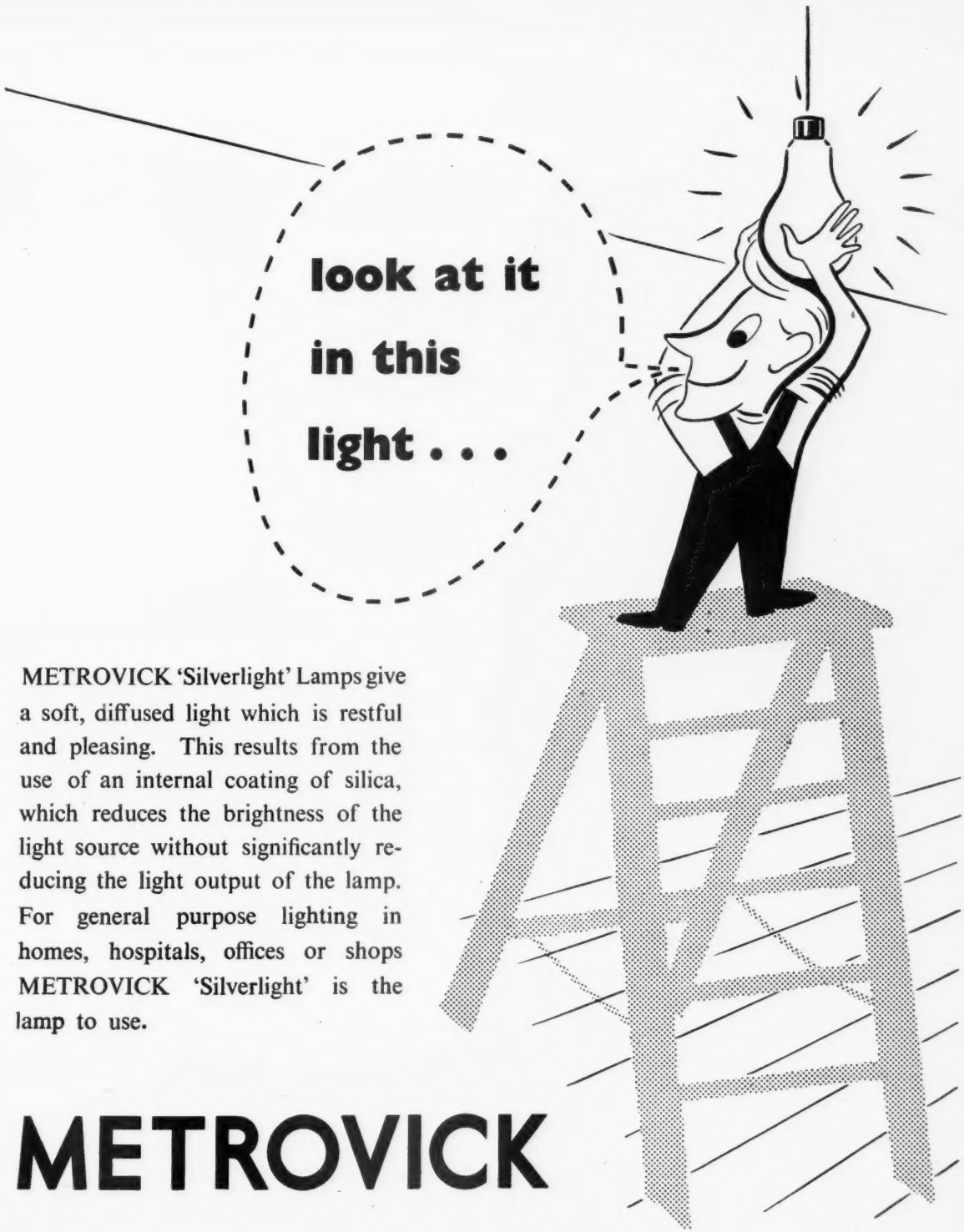

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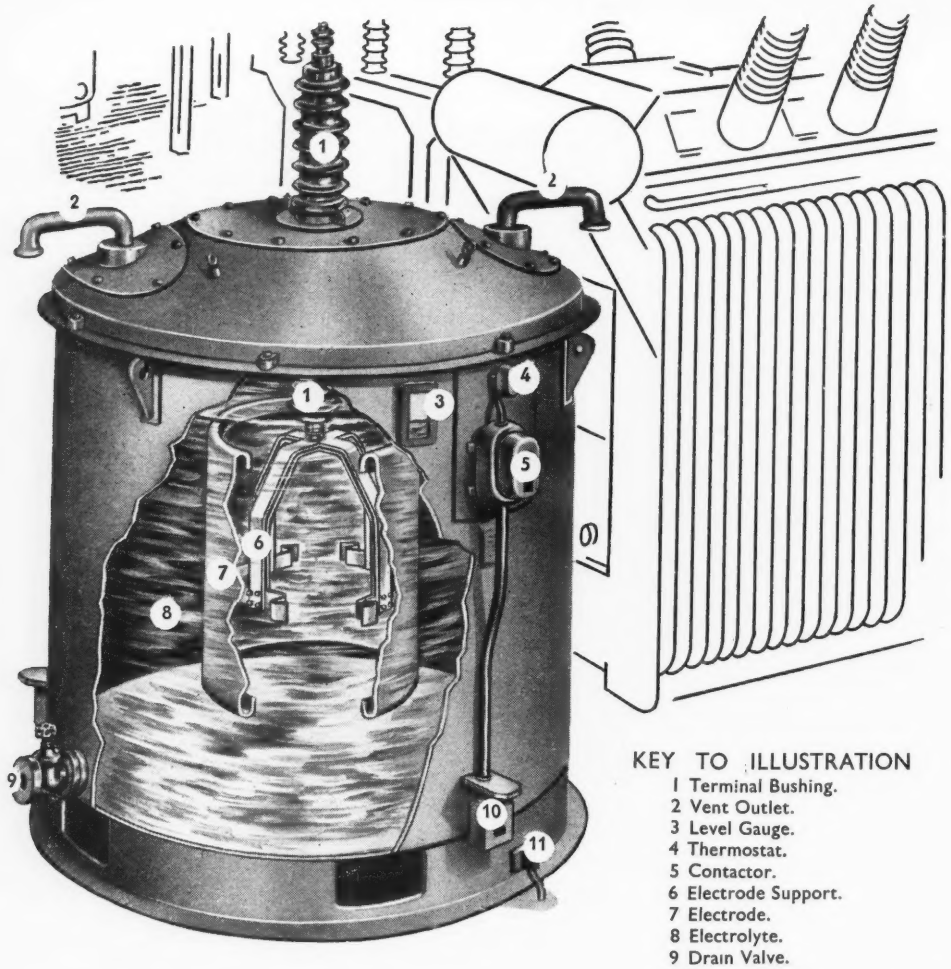

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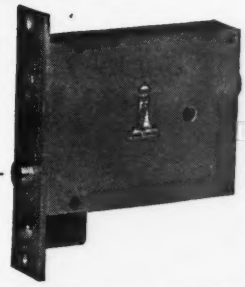

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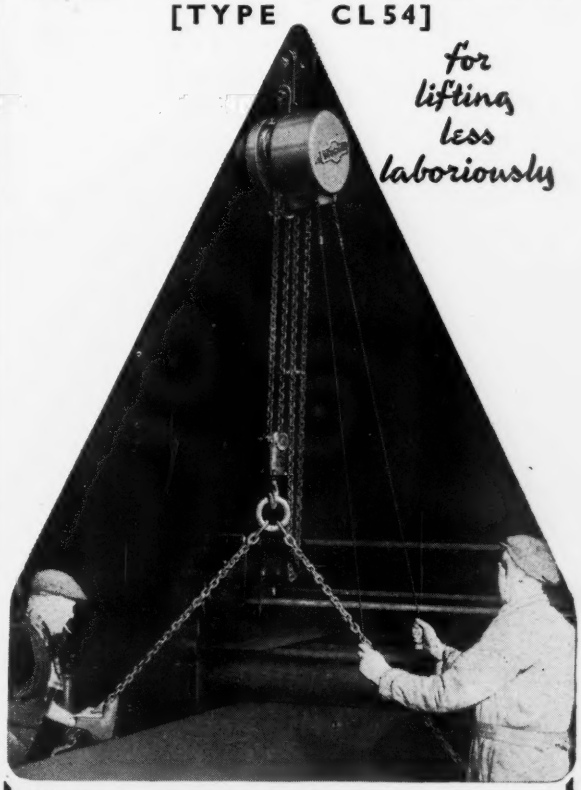

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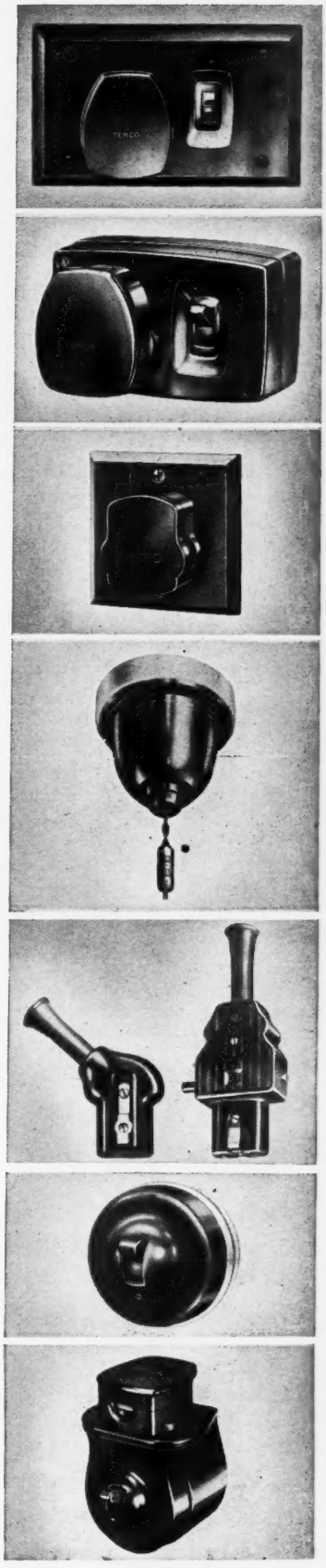

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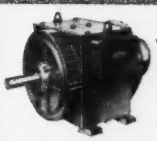
the	BRUSH		Square	Path
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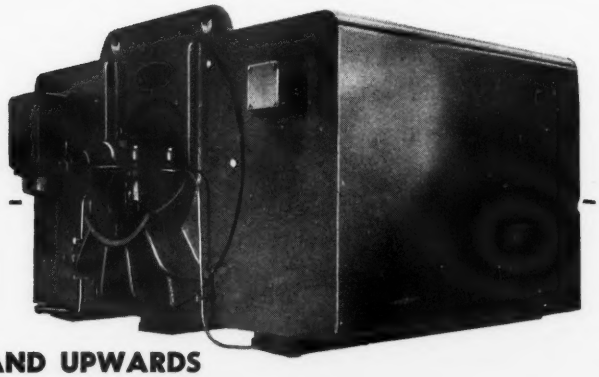

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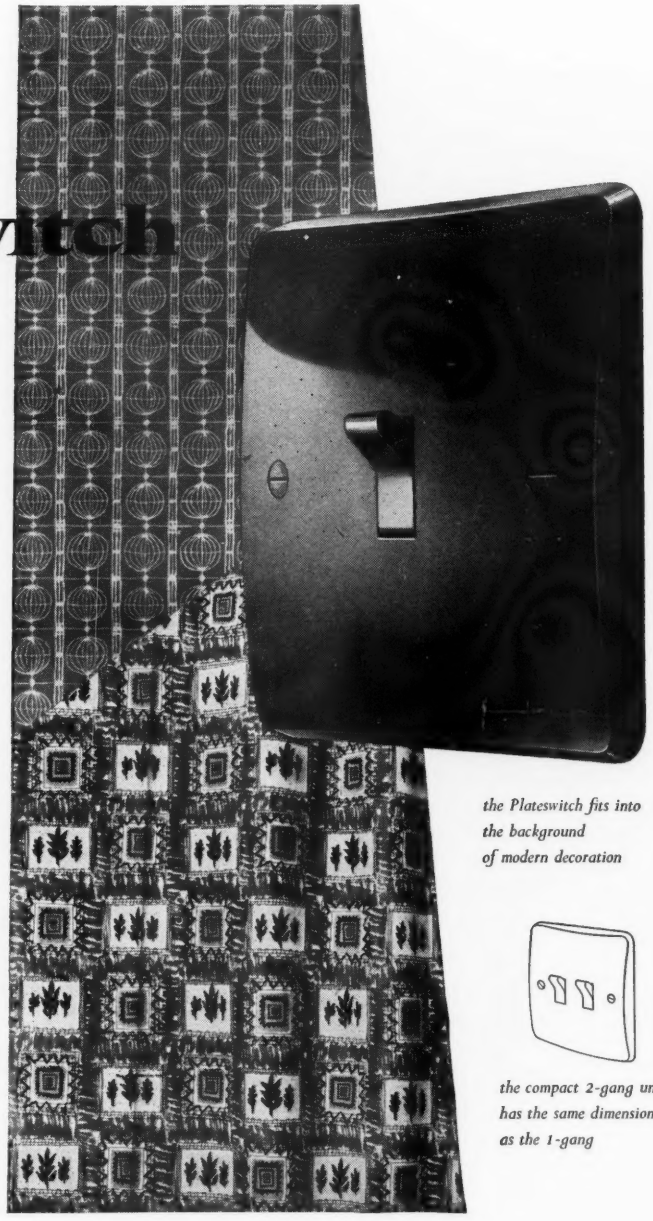

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3 SEPTEMBER 1954

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VOLUME 155 ◇ NUMBER 10

Eighty-Second Year of Publication

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140 INDEX TO ADVERTISERS

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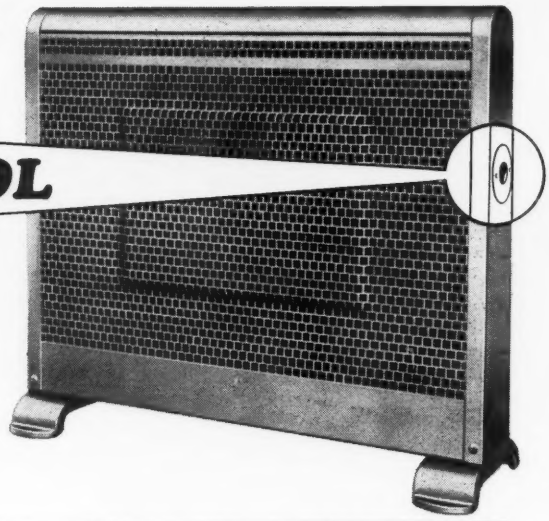

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ELECTRICAL REVIEW

3 September 1954 Vol. 155 No. 10 Established 1872

A National Emergency

THAT there is widespread concern in industrial and educational circles about the low rate at which science and engineering graduates are entering the industry is obvious from the reports on various aspects of the problem that have recently been published. The Institution of Electrical Engineers' latest annual report (*Electrical Review*, 21st May) noted with concern the low rate at which graduates were entering the Institution, and more fundamental aspects of the problem are considered in a Memorandum on "Higher Technological Education" drawn up by the Parliamentary and Scientific Committee (*Electrical Review*, 30th July) and again in the report on "The Shortage of Science Teachers" recently published by a committee specially set up by the Federation of British Industries (*Electrical Review*, 13th August). And now at the British Association meeting at Oxford, three years after the Duke of Edinburgh's appeal in his presidential address for more recruits to science and engineering, a paper is being read on "Recruitment to the Engineering Profession."

The F.B.I. report paints a very serious picture of the shortage of science teachers now and in ten years' time when, owing to the increased birth rate, the ratio of science teachers to pupils in our grammar schools will be worse. Yet if we have no increase in the number of science teachers we shall have fewer scientists and technologists leaving the universities and colleges, and unless more technologists are available our industry will become paralysed.

We publish elsewhere in this issue an article on the educational aspects of this national problem in which the author analyses the problem still more deeply and suggests remedies which are, in the widest sense of the word, educational. The country as a whole, the author suggests, is not aware of this problem nor of the drastic remedies it demands. This must seem strange to our readers who are vitally concerned with industry, but if it is true others must follow the bold lead given by the F.B.I. in calling the conference in January and in sponsoring a committee to examine the situation.

It is also contended that the problem should be tackled at Government level and by local authorities and by schools and industrial concerns and by individuals in the schools and industry. Indeed, it is a problem that must be tackled by each one of us, and while great responsibility rests with the schools and all concerned with education, industry has shown that it can lead, assist and foster any campaign to cope with the problem. It is vital that Government action should be taken to ensure that terms of employment for science teachers should be as favourable as those in industry, but as it is asserted in the article this is not the whole answer to this urgent problem. Some of the other suggestions in the article may well be impracticable, but they may, by provoking disagreement, lead to schemes which can be carried out. The subject is one of particular importance to the electrical industry and so we ask, "What is the electrical industry going to do about this extremely serious and urgent problem?"

GENERATION IN SOUTH WALES

Perhaps because the power cuts of two or three years ago affected South Wales more than most areas, the erection of the new Carmarthen Bay power station, near Llanelly, seems to have met with more public favour than have some other stations elsewhere and also with more material assistance from the several authorities concerned. Some of this approval was, however, no doubt attributable to the neat appearance of the functional building as a result of the virtual concealment of the coal-handling plant. In addition there was the attractive brick-cladding of the fabricated-steel framework which, Sir Henry Self pointed out, gave a pleasing finish at small cost—a cost, we surmise, that was more than repaid in local good will.

MANAGEMENT AND WORKERS

Joint consultation—to quote an answer given to a questioner at a recent meeting in the North West, Merseyside and North Wales Division—is an ideal: something that is never completely attained. Nevertheless, from the latest report of the National Joint Advisory Committee it is clear that a great deal has been accomplished in the electricity supply industry since the joint consultation machinery was established in 1949. The greatest advances so far have been in the fields of safety and technical efficiency, but the Local Advisory Committees, or L.A.C.s as they are commonly called, are being encouraged to broaden the scope of their activities. The B.E.A., in its 1952–53 report, emphasized that the success of joint consultation depended upon the active support of employees generally. To secure this 250 six-monthly meetings with employees were arranged last year compared with only a hundred in 1952–53. The proportion of the total available employees attending ranged from 10 to 24 per cent and it is noteworthy that the largest attendance (275) was at an evening meeting.

IRELAND'S RURAL CAMPAIGN

In Ireland, as in Scotland, electrification is a vital part of the national policy which aims to make conditions more attractive, so preventing depopulation. The economy of Ireland being largely agricultural, the Government has fostered a vigorous rural electrification campaign and already capital subsidies totalling £4,000,000 have been made available to the Electricity Supply Board for this purpose. From figures given in the Board's latest report it is seen that since the scheme was inaugurated in 1947 over 101,000 rural consumers have been connected, more than 23,000 of them last year alone. The rate of development is now being stepped up still more. Between June and October, 1953, an increase of 50 per cent was achieved. At the end of March last the work was proceeding at the rate of 75 areas a year compared with 60 actually completed in the preceding twelve months, and this year the annual rate is expected to rise to 100 areas. A great deal still remains to be done, however, for nearly two-thirds of the rural population are still without a supply of electricity. In the areas already served there is scope for greatly extended use of electrical equipment, particularly on the farms.

CABLE STANDARDS

In the foreword to the latest edition of B.S. 480, "Paper-Insulated Cables for Electricity Supply" (see *Electrical Review*, 20th and 27th August) reference is made to E.R.A. report, Ref. F/T 183: "Tables of Current Ratings for British Standard Paper-Insulated Cables with Explanatory Notes, including Appendix on Methods for Determination of Thermal Resistivity of Ground. (For Voltages up to 33 kV)." This report, which we understand to be in an advanced stage of preparation, will supersede Ref. F/T 128, and will contain current ratings and maximum permissible operating conductor temperatures for paper-insulated cables supplied in accordance with the above standard. Pending the issue of this report the Electrical Research Association tells us that it will be pleased to answer any inquiries regarding current ratings for cables in accordance with the new British Standard.

SHOWMANSHIP NEEDED

A general impression prevails here that the American electrical industry intensively applies all possible means of selling equipment. Indeed we are frequently exhorted to study American salesmanship and profit by this example. It therefore comes as something of a shock to find the New York *Electrical World* complaining that appliance dealers need showmanship; it says:—

> "It is a miracle that electric appliance stores ever sell any. Walk into the average store. The shelves are stocked with the best appliances in the world. But not one is being demonstrated. Even worse the store is not ready to demonstrate any appliances other than the radio and TV."

This is a very sweeping condemnation. If it is justified we can feel a little complacent in the fact that conditions are not quite so bad here. That is not to say that everything is perfect; our dealers still have their shortcomings even if they are not so thoroughly slack as their American counterparts are said to be.

ELECTRIC FIRES

The next in our series of illustrated surveys of domestic appliances, to be published on 10th September, will deal with fires and will give in tabular form details of type, elements, finish, price and purchase tax. The information will prove of great value for reference purposes and as the demand is likely to be heavy orders for additional copies of the *Electrical Review* should be placed without delay. The next survey, on 1st October, will cover low temperature space heaters. Cookers were dealt with on 20th August

Carmarthen Bay

OFFICIAL OPENING OF 345 MW POWER STATION IN SOUTH WALES

THE first section, 105 MW in capacity, of the new power station on the Burry estuary, Carmarthen Bay, was officially inaugurated last Friday by Sir Henry Self, deputy chairman (administration), British Electricity Authority. The station is scheduled for completion to 345 MW by 1957 through the addition of four 60 MW sets to the present installation. The site covers 214 acres and includes ten miles of railway sidings to accommodate 600 wagons of coal and 300 empty wagons, $2\frac{3}{4}$ miles of 21ft roadway and $\frac{3}{8}$ mile of 15ft roads. Approximately 16,000 tons of structural steel will be used for the main buildings which are brick-clad fabricated steel frames. The following technical particulars relate in general to the completed station.

Steam will eventually be raised by fifteen boilers in three boiler houses, each 225ft long by 220ft wide with a single brick chimney 20ft in diameter at exit and 300ft above ground level and mounted on reinforced concrete pedestals which extend up to the level of the boiler house roof, for which asbestos decking is used.

Steam Raising Conditions

The boilers are Babcock & Wilcox high-head single drum units, rated at 240 k lb/hr with steam conditions of 940 lb/sq in and 925 deg F. The output is delivered to six receivers which are interconnected individually and in pairs. Combustion, steam pressure and temperature are automatically controlled. The furnaces are water cooled with Bailey blocks and are designed for burning semi-bituminous pulverized coal with a minimum volatile content of 13 per cent and a maximum ash content of 15 per cent.

Each boiler has a furnace heating surface of 4,375 sq ft and a furnace volume of 21,900 cu ft; a multi-loop draining superheater with primary and secondary heating surfaces of 8,150 and 2,900 sq ft and two surface attemperators between them; 22 sootblowers, hydraulically operated with automatic sequence control; a multi-loop economizer of 9,600 sq ft in two parallel water banks which raises the feed temperature from 365 to 502 deg F; and two contra-flow Howden-Ljungstrom 34,200 sq ft air heaters, giving a combustion air temperature of 533 deg F at maximum continuous rating. The primary superheater is in two banks, one of carbon steel and the other of 0·5 per cent molybdenum steel. The secondary is of Esshete C.M.L. alloy.

For each boiler two induced-draught fans (62,000 ft/min) and two forced-draught fans (39,700 ft/min) driven by variable speed motors are provided. The last named take air from the top of the boiler house and deliver it to the combustion chamber through a rotary air heater. The capacity of the two primary air fans is 26,000 cu ft per minute each.

The gases after passing through the economizer, air heaters and two Prat-Daniel dust collectors are taken to an electrostatic precipitator of the Sturtevant Engineering Co.'s make. Any solid matter in the gases travels upwards through a nest of earthed tubes which form one electrode, the other electrode being suspended within each tube and connected to a unidirectional high voltage mechanical rectifier. The solid matter is driven by the ionizing field thus created to the tube walls and there precipitated into hoppers by automatic rapping gear. Separate rectifiers are provided for each precipitator and the equipment includes a low-voltage control panel, voltage regulator and oil-immersed step-up transformer; the sets are electrically connected in groups of three, so that any unit can operate any precipitator of that group. Six sets of electrical equipment were provided by the B.T.H. Co. as sub-contractors. Feed water will be supplied by nine 3,000 r.p.m. electric feed pumps (Harland Engineering Co.) and three stand-by 5,000 r.p.m. steam pumps (G. J. Weir), all rated at 550 k lb/hr. Make up from the town mains passes through a Paterson water softening plant and an Aiton evaporating plant. Chemical injection into the feed suction and boiler drums is provided. The associated and other tanks (12) are by Braithwaite & Co.

Coal for each boiler is pulverized in three B. & W. "E44" pressure mills and is fired by nine down-draught burners at the front of the furnace; lighting is done by two electrically ignited oil burners.

Coal Handling

Each boiler house has a duplicate wagon discharging and conveying system with a combined handling rate of 150 tons/hr. Except for the wagon tipplers (by Strachan & Henshaw), which are a little way from the boiler house, none of the coal handling equipment is visible externally. Coal from the tippler hoppers is fed by electric vibrating feeders on to 24in belt conveyors, which have magnetic head pulleys and suspended magnets for removing tramp iron. The conveyors discharge into gravity bucket conveyors within the chimney base which raise the coal sufficiently to pass through crushing and "Niagara" screening plant before going on to the 375 ton steel bunkers, of which there are three per boiler house manufactured by the South Durham Steel & Iron Co.

Six belt conveyors are driven at 200 ft/min by $7\frac{1}{2}$ h.p.

motors and twelve gravity bucket conveyors at 50 ft/min by 35 h.p. motors, except those in the chimney base which are of 16 h.p. All these motors are by the British Thomson-Houston Co. as part of an order from Babcock & Wilcox for 100 squirrel-cage totally enclosed fan-cooled or closed-air circuit machines, including 26 for driving boiler-house auxiliaries, in sizes ranging from 200 h.p. to fractional. On completion of the station the number will be approximately doubled. Coal is reclaimed from the storage area, which has a capacity of 140,000 tons, by a transporter rated at 100 tons/hr. The stocking out conveyor is of the belt type with a duty of 125 tons/hr made by the Rhymney Engineering Co.

Ash handling plant, by B.V.C. Industrial Constructions, is provided for five boilers with dry hoppers and ten with water-filled hoppers. From these the ash is discharged at intervals to sluiceways, leading to a sump whence it is pumped to an ash area of 85 acres. Duplicate ash sealing and overflow pumps and one crusher are installed in every boiler house. The ash pumps are of 1,600 gal/min capacity and in view of the length of the ash discharge line (5,000ft), booster pumps of the same rating are used. Four high pressure sluicing pumps are installed in the circulating water pump house.

The six turbines are of the Metropolitan-Vickers three-cylinder multi-stage type running at 3,000 r.p.m. and taking steam at 900 lb/sq in and 900 deg F. They exhaust to twin two-pass condensers designed to give a 29in vacuum with circulating water (44,000 and 50,000 gal/min) at 58 deg F; the system incorporates two three-stage air ejectors and vertical extraction pumps. A five-stage feed-heating plant includes two low-pressure heaters, one de-aerator and two high-pressure heaters.

Variable Speed C.W. Pumps

Circulating water is drawn from the Burry estuary by seven Vickers-Armstrongs vertical two-stage axial-flow pumps (one being a stand-by) with individual duties of 52,600 gal/min at 365 r.p.m. against a total head of 25ft. Owing to the large tidal range three of the pumps are driven by variable speed 935–193 h.p. 472–292 r.p.m. motors (by Laurence, Scott & Electromotors); the other four are 560 h.p. constant speed 365 r.p.m. machines (by B.T.H.). At the inlet are seven Brackett central flow band screens. The discharge from the condensers is taken to a point 1,080ft upstream. In the turbine house is a 130 ton Cowans, Sheldon crane.

The two 11·8 kV 52·5 MW alternators now in commission are air cooled, but the later four, of 60 MW capacity, will be cooled by hydrogen at 0·5 lb/sq in. Their output is fed direct to 63 and 72 MVA 11·8/132 kV A.S.E.A. generator transformers manufactured at Walthamstow by the Fuller Electrical & Manufacturing Co., which is also supplying two 10 MVA 132/3·4 kV station transformers and six unit 6 MVA 11·8/3·4 kV transformers for auxiliaries. All these transformers are water cooled and the generator and station transformers are fitted with on-load tap changing gear.

The station and unit transformers (which are in the turbine house) feed the auxiliary network through B.T.H. 3·3 kV 150 MVA and 415 V 25 MVA air-insulated air-break switchgear. Air-cooled 250 and 500 kVA 3·3 kV/415 V transformers, by the Hackbridge & Hewittic Electric Co., are housed with the auxiliary switchgear. Fusegear for the 415 V circuits is by the Simplex Electric Co. A stand-by 150 kVA diesel set made by National Gas and Oil Engines, Ltd., is also installed. Batteries and rectifiers (Alton Battery Co.) supply d.c. for operating switchgear and for some emergency lighting.

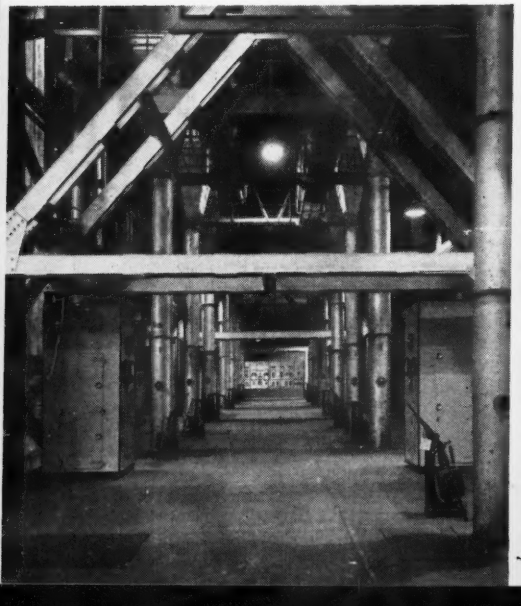
High-Voltage Switchgear

The main 132 kV switchgear, which controls twenty circuits, is of the Ferguson, Pailin air-blast type with a rupturing capacity of 2,500 MVA. Though of outdoor design, it is protected from salt spray by housing, which is found to save floor space. In addition to the generator and station transformers, which are connected by single-core 132 kV Pirelli-General oil-filled cables, there are eight feeder, two reactor and two bus-coupler circuits. The feeders are overhead lines (constructed by British Insulated Callender's) connecting the station to the grid system.

The main control room for this switchgear is in the power station, to which multi-core cables are run in a tunnel which also accommodates the low voltage cables from distribution boards in the power station. Aluminium sheathed rubber-insulated cable is used for all lighting, heating and socket-outlet circuits. The lighting and heating work in the 132 kV switch house was done by R. Alger & Sons. Cables other than those for 132 kV were supplied by the Britannic Electric Cable & Construction Co., B.I.C.C. and the Hackbridge Cable Co. The lighting of the station as a whole was the responsibility of the Metropolitan-Vickers Electrical Co.

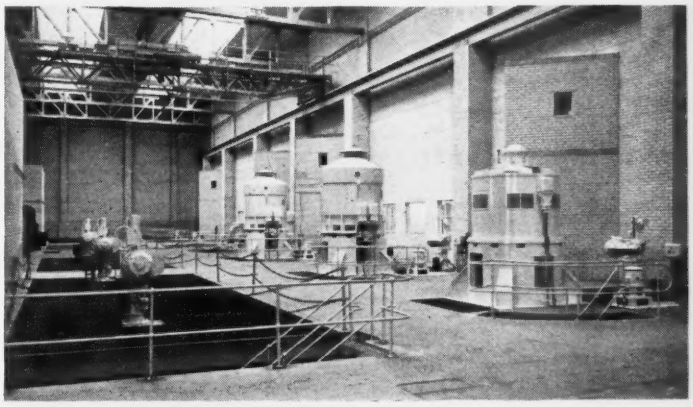
On vesting day (1st April, 1948) Carmarthen Bay power station, which was being built by Balfour, Beatty & Co.

Firing aisle for No. 1 boiler house



There are three fuel pulverizing mills to each boiler

Circulating water pump house under construction, and below, the interior showing three of the pumps



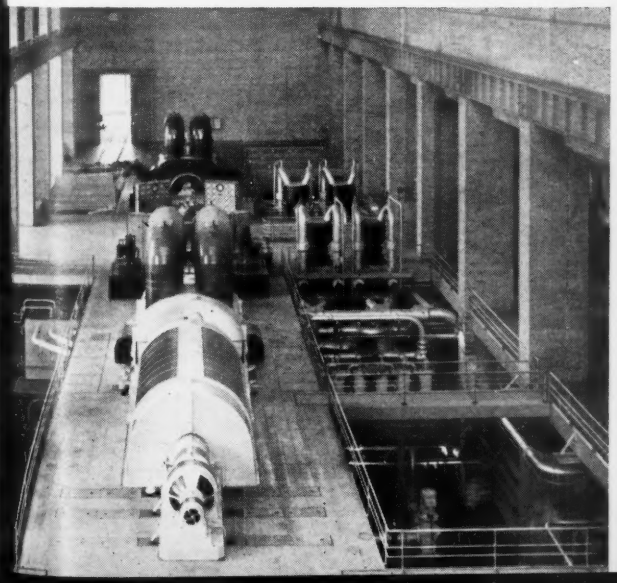
(now acting as civil engineering consultants), was taken over by the British Electricity Authority. Mr. H. V. Pugh was then appointed as divisional controller and Mr. T. H. Wood as chief constructional engineer. They were succeeded respectively by Mr. H. J. Bennett in October, 1951, and Mr. C. W. Priest in April, 1953.

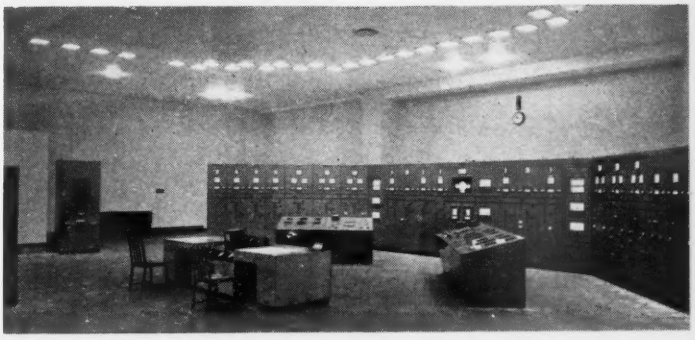
Contractors not already mentioned included: Frederick Braby, staircases; Chimneys, Ltd., chimneys and brick flues; Bailey Meters & Controls, instrument panels; Newalls Insulation Co., thermal insulation; Dewrance & Co., h.p. valves; Hopkinsons, Ltd., h.p. valves; Alley & McLellan, l.p. valves; Blakeborough & Sons, l.p. valves; Stewarts & Lloyds, h.p. pipework; Broom & Wade, air compressors. Site clearance, which was started in April, 1947, included the demolition of some old copper works, including a 300ft chimney and the raising of the ground level by 8ft. Trial borings revealed a thick seam of sandstone rock 65ft below layers of sand interlaced with clay. With a standing water level 12ft beneath the surface, a dewatering system (reputed to be the largest of its kind) by continuous pumping maintained the working conditions required to construct the foundations 40ft below ground level. Excavation for the main building basements started in June, 1948, and 5,500 reinforced concrete piles were driven to support the turbine and boiler houses. Approximately 3,100 tons of sheet steel piling were used for the circulating water pump house. The first generating set was commissioned in June, 1953.

Inaugural Ceremony

At the opening ceremony Mr. Bennett, in welcoming the visitors, said that the new station was the complement in the west of the Division of Uskmouth in the east. About 80 per cent of the electricity supplied in South Wales went to industry, for which the kWh had risen sharply this year. Sir Henry Self compared the 60 per cent increase in generating capacity (from 546 to 878 MW) in South Wales since vesting day in 1948 with 50 per cent for the country as a whole. This preferential treatment was required to correct previous plant deficiencies. Three further stations were planned for South Wales, viz. Uskmouth "B" (360 MW), Rogerstone (120 MW) and Aberthaw (600 MW). He paid tribute to the planning and initial work on Carmarthen Bay station of Balfour,

The two 52,500 kW turbo-alternators now in commission





The main control room which is situated within the main building

Beatty & Co., Ltd. (now contractors for the whole of the construction work except the 132 kV switchgear), and to Sir Percy Thomas, its architect. A vote of thanks was proposed by Sir Andrew M. MacTaggart (chairman of Balfour, Beatty & Co., Ltd.), who referred appreciatively to the co-operation of the B.E.A. Division's staff, and by Alderman Emrys Aubrey (chairman, Carmarthenshire County Council). After a presentation to Sir Henry and Lady Self of examples of local workmanship, Sir Henry pressed a button which opened a main door of the station to admit the visitors on a tour of inspection.

Magnetic Amplifiers

A General Survey

By GEORGE M. ETTINGER, M.Sc.

THE term "magnetic amplifier" may be applied to a large group of devices having one factor in common: control of a.c. by continuous (as distinct from step-by-step) variation of inductance. Control in medium and high power circuits can be achieved by means of simple saturable reactors; these have been employed for half a century.[1, 2] Typical examples are the dimming of theatre lights and the regulation of electric furnaces.

It is preferable, however, to reserve the term "magnetic amplifier" for those devices which give variable d.c. output in response to variable d.c. input. Typical applications are audio-frequency magnetic amplifiers for public address work, control equipment for rotating machinery, photocell amplifiers and the like. These magnetic amplifier applications have only become practicable during the last two decades as improved magnetic materials and metal rectifiers have been developed.

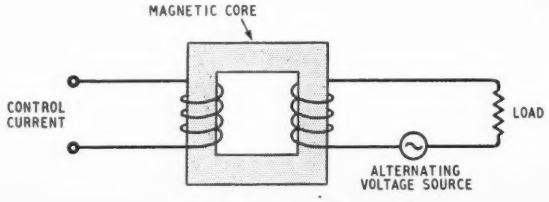


Fig. 1.—A simple saturable reactor

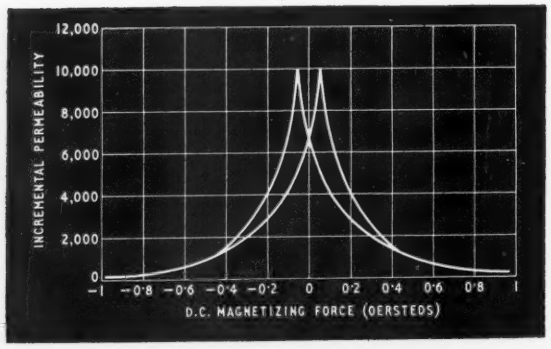


Fig. 2.—"Butterfly" curve for Mo-Permalloy

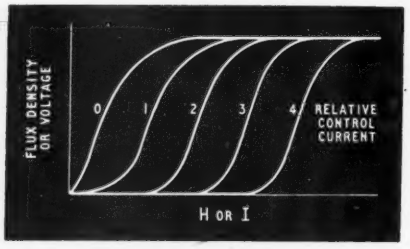


Fig. 3.—Composite characteristic of a simple saturable reactor

For high power work, the saturable reactor has the advantage of good efficiency. Thus, a.c. power supplied to a load can be controlled, if not from full load to zero, at least from full load to, say 10 per cent, with power losses rather smaller than those of transformers of similar rating. If variable resistance were used for the same control range, considerable power would be wasted whenever the desired load power was small.

On the other hand, the first cost of high power saturable reactors is considerably greater than that of resistance banks. It may be stated quite generally that resistance control of power will be more economical in cases where control has to be exercised infrequently only, as in motor starting. For continuous operation, such as in electric furnace temperature regulation, it is often advantageous to employ saturable reactors.

It was a disadvantage of early forms of saturable reactors that their response was slow; time constants were of the order of a number of cycles of the excitation frequency. In recent years various circuits have been developed which give faster response.[3, 4, 5] However, thermionic or transistor amplifiers are preferred where very rapid operation is required.

Other important considerations in certain control systems, especially for mobile and airborne installations, are ruggedness and low weight. Magnetic amplifiers are to be preferred to thermionic amplifiers in these respects. The advantage of magnetic amplifiers is maintained as long as suitable a.c. power supplies are available. For certain high frequency magnetic amplifiers it is necessary to provide excitation power at frequencies higher than those obtainable from rotary machines. In such cases valve oscillators may be necessary to drive the magnetic amplifiers, so that the advantages of ruggedness and infinitely long operating life are immediately lost.

Fig. 1 shows a basic saturable reactor circuit. It consists of a load (usually, but not necessarily, resistive) in series with a two-winding reactor and a source of alternating current. Let it be assumed for the moment that the reactance (unsaturated, i.e., in the absence of d.c. control current) is considerably greater than the sum of the source and load resistances.

Now consider the characteristics of the magnetic core material on which the reactor is wound. This characteristic,* known as a "butterfly" curve,[6] is shown in Fig. 2. The incremental permeability of the core material falls as the d.c. magnetizing force is increased; the distance between the two peaks of the curve is substantially equal to twice the coercive force of the magnetic material. In the case of 4–79 Permalloy, for example, the incremental permeability falls to about one-tenth of its maximum value when the material is subjected to a steady field of 0·5 oersted. A curve of normal permeability *versus* alternating load current, in the absence of d.c. control current, would be similar to one "wing" of the butterfly curve.

Combining now the information on incremental permeability and that on normal permeability, a family

* This curve is of great importance also in the design of amplifier output transformers, where d.c. is superimposed on the signal current, unless push-pull operation is ensured.

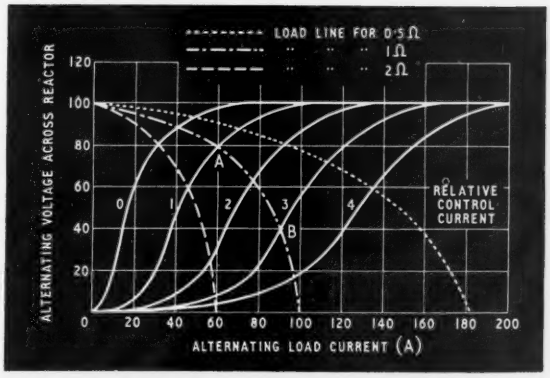


Fig. 4.—Characteristics of a saturable reactor with finite load resistance (elliptical load lines are shown)

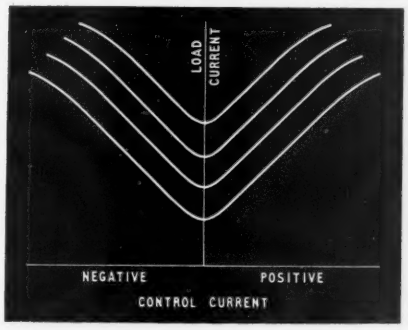


Fig. 5.—Control characteristics of a saturable reactor for various amplitudes of excitation voltage

of alternating current-voltage curves* may be plotted, as shown in Fig. 3. These, essentially, determine the characteristics of the saturable reactor.

In control systems (including valve circuits) which employ variable resistance, the phase of the load current is substantially unaffected by variation of the control element. In saturable reactors, on the other hand, phase angle varies with control current. To determine the control characteristics of a practicable saturable reactor, the well-known circle diagram for constant resistance and variable reactance is employed, as shown in Fig. 4. Alternating voltage across the saturable reactor is plotted as ordinates, and load current (or, subject to scale change, load voltage), as abscissæ. For a load resistance of one ohm, a circle diagram may be drawn, representing the equation $V_L^2 + V_{SR}^2 = E^2$, where V_L and V_{SR} are the voltage across the load and voltage across the saturable reactor respectively, and E is the applied voltage. Different operating points are established as the control current is varied so as to produce, in the example of Fig. 4, zero to 4 ampere turns.

If the load resistance is not equal to one ohm, the load line becomes elliptical, to satisfy the equation $V_{SR}^2 + (IR_L)^2 = E^2$. To maintain the scales of the diagram as load current and load voltage, the elliptical load line must be drawn with major and minor axes in the ratio R_L. Load lines for resistances of 0·5, 1 and 2 ohms are drawn in the figure.

Another very useful curve may be plotted from the load lines. This is the control or " mutual " characteristic of Fig. 5, relating load current and control current for a particular load resistance and for various applied voltages. This control characteristic is useful in the analysis of self-excited or feedback-type magnetic amplifiers.

Consider the circuit of Fig. 6, which includes an additional feedback winding and a set of bridge connected rectifiers. Clearly, any increase of control current and load current causes additional current to flow through the feedback winding. This, in turn, aids the control current, establishes even more control flux, and the load current continues to increase. The effect is, therefore, one of positive feedback, regeneration or self-excitation.

This may easily be understood from the construction[7] of Fig. 7. When control current is zero, the current through the feedback winding is equal to the abscissa OS_0, so as to establish a load current I_0. (Without feedback, the load current for zero control current would be merely equal to ordinate OP_2.) A small increase of control current, Oi_2, causes the load current to change from OI_0 to OP_2, i.e., by about 50 per cent. In the absence of feedback, the corresponding change would be only about 10 per cent.

Typical characteristics of feedback magnetic amplifiers are shown in Fig. 8, for various amounts of feedback. It will be realized, of course, that the effect of feedback can also be obtained without an external feedback winding, merely by connecting a rectifier in series with the load resistance (direct feedback). In this case, an increase of

* Subject to the necessary scale changes, and subject also to errors due to non-sinusoidal waveshape, the alternating current-voltage curve is, of course, the same curve as the well-known B–H or magnetization curve for the core material.

Fig. 6.—Series connected magnetic amplifier with external feedback. Fig. 7.—Construction for magnetic amplifier control characteristics. Fig. 8.—Control characteristics of magnetic amplifier with various amounts of feedback

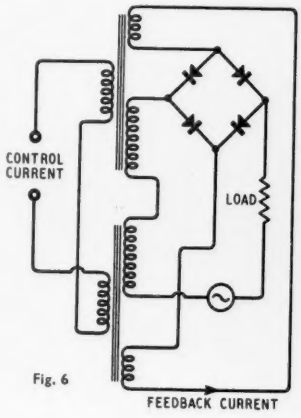
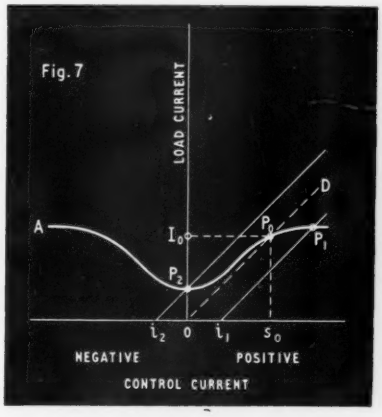
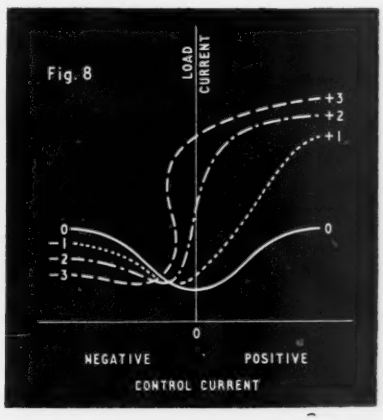


Fig. 6





control current, and therefore of alternating load current, produces a greater d.c. component of current through the load winding. This component, of course, acts on the magnetic core so as to aid the control ampere turns.

When the control current in a feedback magnetic amplifier is varied through zero to negative values, the sense of feedback reverses (Fig. 8), so that feedback current now opposes the control current. The result is negative feedback or degeneration, and reduced gain is obtained.

Analogies might be drawn between feedback magnetic amplifiers and amplidynes, and between non-feedback magnetic amplifiers and metadynes. Power gains are of the same order. However, it is not usual to build magnetic amplifiers for power levels as high as those at which rotary machines commonly operate. On the other hand, the bandwidth of magnetic amplifiers, excited from high frequency supplies, can be made rather greater than that of amplidynes. It is seen, therefore, that the two groups of devices are, to some extent, complementary.

Saturable reactors have been built in three main forms: shell type, core type, and toroids. The shell type conforms most closely to usual transformer practice. It has the advantage that no fundamental or odd harmonic frequency voltages are induced in the control winding. Also, where very good performance is not required, it is often possible to use existing power transformers as saturable reactors.

Core type saturable reactors are rather less efficient in the use of control power, but otherwise their performance is quite similar to that of shell type designs. There is a possibility, however, that high voltage may be induced in the two separate control windings. Therefore, rather more attention must be paid to control winding insulation in core type saturable reactors, particularly where the turns ratio is high, i.e., where high current gain is required.

Both core and shell type designs have magnetic leakage, just like transformers. This means that the maximum inductance of the reactor is rather lower than that calculated from considerations of core material permeability and dimensions; consequently, for a given maximum load current, the minimum standing current will be rather high.

It is desirable, therefore, to employ mechanical designs which have substantially no leakage. This condition is met in toroidal constructions which have no air gap. A typical arrangement is sketched in Fig. 9. A single control winding embraces two toroidal cores each carrying an a.c. or load winding. The two a.c. windings are connected in series opposition with respect to the control winding, so that (at least in the absence of control current) no alternating voltage of fundamental or odd harmonic frequency is induced in the control circuit.

It has already been stated that response time of known magnetic amplifiers is equal to one or more cycles of the excitation frequency. In many power applications the excitation frequency is predetermined, such as 50 c/s or 400 c/s; there are other applications where the choice of frequency is open to the designer of a magnetic amplifier. It might appear at first sight that the time constant can be made as small as desired by increase of excitation frequency. This, however, is not so, because the magnetic properties of the core become poorer at higher frequencies due to eddy current losses and hysteresis. The former are, of course, reduced for thinner laminations. It would be impracticable to make laminations a fraction of a thousandth of an inch thick, and then to stack them. Instead, it is possible to roll continuous magnetic tape, insulated on one side, of thickness down to 0·00013in.[8] Such tape may be wound directly on a ceramic spool and annealed at high temperature to obtain the desired magnetic properties.

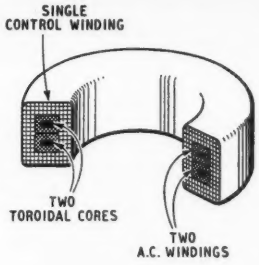


Fig. 9 (right).—Toroidal construction of balanced saturable reactor

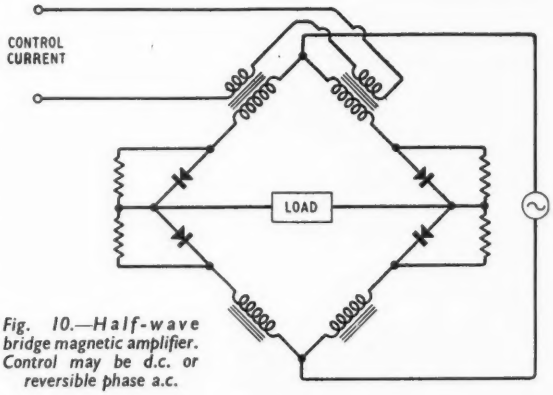


Fig. 10.—Half-wave bridge magnetic amplifier. Control may be d.c. or reversible phase a.c.

Experimentally, response times of the order of a few microseconds have been obtained for magnetic amplifiers[9] wound on " ultra-thin " cores. Materials which have been rolled in this way include grain-oriented silicon iron and " Supermalloy."

Response time and, correspondingly, phase shift characteristics are of importance in high-performance servo amplifiers. A negative inductance circuit which compensates for the positive inductance of magnetic amplifier control windings has been described elsewhere[10] by the author. Fast response (delay smaller than one cycle of the excitation frequency) is a property of half-wave magnetic amplifiers. The most useful circuit for servo-motor drives is the half-wave magnetic amplifier bridge (Fig. 10) which was described by Woodson, Thrower and Schmid.[11] Output is in the form of reversible polarity pulses and may be used to drive d.c. or a.c. motors. Correct operating points for the magnetic cores are established by means of four resistances which carry reverse or demagnetizing current during the non-conducting half-cycle.

A three-phase design is sketched in Fig. 11. This, it will be seen, is essentially a connection of three single-phase circuits. Analysis may be carried out separately for each of the three phases, if balanced. For unbalanced loads, the methods of symmetrical components may be employed with certain complications due to the non-linearity of the characteristics.

Waveforms in saturable reactors or magnetic amplifiers are never sinusoidal. For high sensitivity, the magnetic material must be operated between the knees of the magnetization curve, even in the absence of control current. This excitation, of course, introduces odd harmonics. As soon as control current flows, even harmonics are generated. Therefore, the form factor in these devices departs widely from 1·11. With large control currents, form factors of the order of two or more may be obtained,[12] so that analysis by linear circuit theory is, at best, approximate. Greater power can be delivered into resistive loads, such as furnaces, than the d.c. power available for controlling motor fields or the like.

With finite load resistance, the ratio of initial to final load current is smaller than the ratio of final to initial reactance. This becomes obvious when it is considered that a constant current circuit is obtained with infinite resistance, so that the saturable reactor becomes ineffective.

Referring again to Fig. 4, it is seen that a change of control ampere turns from zero to 3 units has caused the load current to change from 40 A to 90 A only. Thus, load power is changed from 80 per cent to 16 per cent approximately. In some applications, such control ratio is insufficient. To increase the maximum power obtained it is merely necessary to increase the applied voltage somewhat. In the present case, increase of excitation voltage by 25 per cent would give a control range of 20 to 100 per cent, but it is less easy to reduce the minimum power. It is, of course, impracticable to increase the number of turns in the load winding so much as to get substantially closer to zero magnetizing current. Any increase of desired maximum inductance necessitates an increase of winding space, so that a bigger saturable reactor size becomes necessary. Alternatively, core material of very high initial permeability may be selected to reduce magnetizing current for zero control current. This core material might be too expensive for large power saturable reactors. It is common, therefore, to design for " partial range " control[13] only. This gives more economical units, since neither the initial inductance nor the number of control turns need be excessively large.

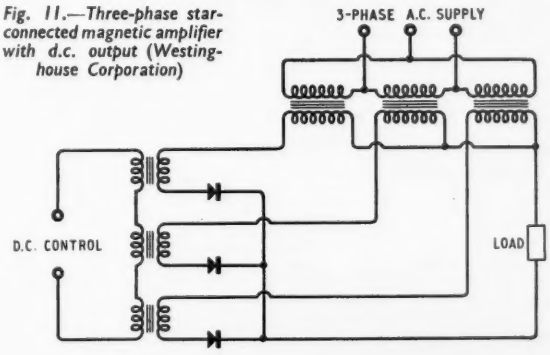


Fig. 11.—Three-phase star-connected magnetic amplifier with d.c. output (Westinghouse Corporation)

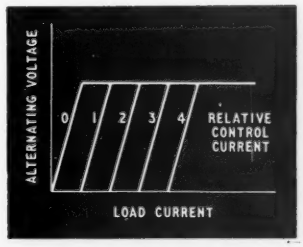


Fig. 12.—Current-voltage characteristics of saturable reactor with ideal core material

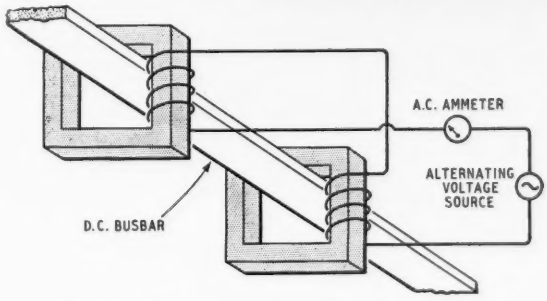


Fig. 13.—A d.c. current transformer (after McClure)

Power losses in saturable reactors will generally be smaller than those in transformers of similar rating. This may easily be seen from the circle diagram of Fig. 4. At operating point A, the reactor carries almost full line voltage, but very little current. At point B, on the other hand, it carries large current but small voltage. Therefore, full iron losses and full copper losses will not occur at the same time. Hence rather smaller frame sizes may be built for saturable reactor units than for transformers.

In recent years, magnetic core materials have become available which have extremely high initial permeability and exhibit very sharp saturation. Typical characteristics are indicated in Table 1. For these materials the saturable reactor characteristics of Fig. 6 become more linear, as shown in Fig. 12.

Table I.—Characteristics of Core Materials for D.C. Current Transformers

Material	Composition (balance Fe)	Permeability		B_{max} kilogauss	Rectangularity B_R/B_{max}
		Initial	Maximum		
Silicon Iron	3% Si } Grain	1,800	5,000	20	0·91
Hipersil	3% Si } oriented	6,000	35,000	20	0·9
50 Permalloy	50% Ni	2,100	15,000	16	0·8
Orthonol		800	80,000	15·5	0·92
Deltamax		1,000	70,000	14·5	0·98
Orthonik	50% Ni Grain oriented	1,600	60,000	15	0·98
Hipernik V		6,000	60,000	15	0·96
H.C.R.		1,000	30,000	15·6	0·95

Load current, with such core materials, becomes substantially proportional to d.c. control current. This is exactly the condition required for d.c. current transformers, of which a typical example, due to McClure,[14] is shown in Fig. 13. In this arrangement, the busbar carrying heavy direct current is passed through both the toroidal reactor cores, so as to establish the desired control flux. This ensures that the load current will be in the form of substantially rectangular pulses whose amplitude is nearly proportional to the control current to be measured.

For small busbar current, the standing current through the saturable reactors may cause an appreciable error. Again, the bridge rectifiers employed in a.c. ammeters are not quite linear. By suitable choice of rectifiers it is possible to compensate to some extent for the non-linearity of the magnetic characteristics. Errors may be caused also by variations of amplitude and frequency of the excitation voltage, which should therefore be derived from a stabilized source. On the other hand, it is permissible to open the load circuit of the d.c. current transformer, without establishing a large voltage across the metering terminals.

Another d.c. current transformer design has been described by Horton.[15] He uses gapless " Hipernik V " magnetic cores, and obtains linearities within 0·1 per cent for busbar current variations of 50 per cent. In Horton's circuit, volt drop across a calibrated shunt is measured, rather than busbar current directly. This has the advantage that ampere turns acting on the magnetic core are not excessively large and that the amplifier may be rated at a given meter current per, say, 50 millivolt shunt drop, rather than per unit busbar current.

Simple magnetic amplifier circuits may be designed for motor speed and generator voltage control. In both cases, d.c. generator voltage may be applied to a magnetic amplifier control winding, while another winding receives a reference current* giving equal and opposite ampere turns. Therefore, the output has a polarity depending on whether generator voltage is high or low. Such output can be used to control auxiliary field windings in

* Non-linear resistance bridges are frequently used to produce constant reference signals from fluctuating supply lines.

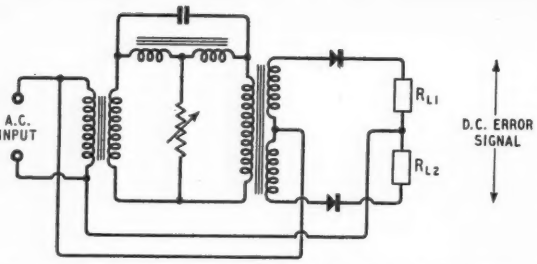


Fig. 14.—Alternator frequency control circuit. Polarity of d.c. error signal depends on sense of input frequency deviation from nominal frequency

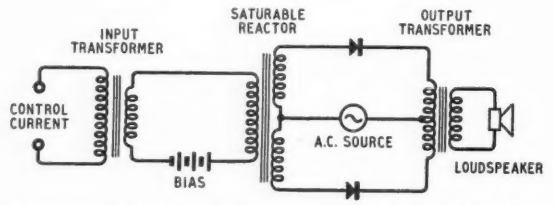


Fig. 15.—Push-pull audio-frequency magnetic amplifier (after Vincent)

a well-known manner. Typical control circuits of this nature have been described by Larson and Dunnegan.[16] To control alternator frequency directly, a circuit based on a magnetic amplifier first described by Bell[17] may be used. This is shown in Fig. 14. The bridged-T circuit may be made as sensitive to frequency changes as desired by adjustment of the shunting resistance. The simple phase-sensitive detector gives a d.c. output of polarity dependent on the sense of the deviation from the desired frequency.

A very important application for magnetic amplifiers has been found in aircraft autopilots. In such devices the amplifiers receive signals representing rates of change of aircraft attitudes (often these signals themselves are derived from magnetic pickups) and, in response, yield power output of sufficient magnitude to control servo-motors which operate the aircraft control surfaces. In one British autopilot all the valves have been replaced by magnetic amplifiers, with considerable improvement of ruggedness and reliability.

For fast-acting magnetic amplifiers the frequency characteristics of the core materials are of importance. The properties of a number of core materials are summarized in Table 2. This shows the frequency at which the initial permeability of the material falls to one-half of its d.c. or low frequency value. Assuming that circuits responding within a few cycles of the supply frequency are employed, Table 2 gives a rough guide to the frequencies which could be handled by magnetic amplifiers wound on cores of these materials. It must be realized, of course, that other limitations, such as high frequency losses in the windings, or capacity of windings, may set a lower limit to operating frequencies.

Table 2.—High Frequency Performance of Various Magnetic Materials

Material			Frequency at which initial permeability falls to half its d.c. value, kc/s
45 Permalloy,	Thickness	2 mils	100
,,	,,	8 mils	10
4-79 ,,	,,	1 mil	50
,,	,,	2 mils	20
,,	,,	4 mils	2
Supermalloy	,,	1 mil	7
,,	,,	2 mils	3
,,	,,	4 mils	1
Mn-Zn Ferrite			3,000

Audio-frequency magnetic amplifiers for public address and similar work have been constructed. Typical is Vincent's[18] push-pull amplifier, shown in Fig. 15. This was used to control output powers up to 500 W and had a bandwidth of the order of 7 kc/s. Audio-frequency amplifiers have been constructed by Logan[19] and others. It is possible, in audio-frequency magnetic amplifier applications, to use either very thin tape wound cores, which have already been mentioned, or "ferrite" materials. These have, in general, rather lower initial permeabilities but possess the advantage that their maximum operating frequencies are higher than those obtainable with the thinnest metallic cores.

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Bricks from Power Station Ash

AS a result of successful research by the Building Research Station, the British Electricity Authority is considering the building of brickworks at power stations. Scientists working on the problem of finding a use for a troublesome waste material, the fly ash from the furnaces of power stations using pulverized fuel, have discovered how to use it to make bricks of good quality. The work was sponsored by the B.E.A. The use of small percentages of ash (up to say 20 per cent) in brickmaking is nothing new and many existing brickworks have tried making such additions. With some kinds of clay the addition of ash is beneficial as the clay is made less sticky and it can be dried and fired more easily. The ash also contains some unburnt carbon which helps to fire the bricks and so saves fuel.

It has been shown, however, by experiments at the Building Research Station (which is equipped for pilot-scale brickmaking) that equally satisfactory bricks can be made with 85 per cent ash and only 15 per cent clay. This discovery opens up the possibility of building new brickworks adjacent to power stations and at the cost of transporting relatively small quantities of clay, the troublesome waste product, fly ash, could be turned into bricks for houses.

Another investigation by the Building Research Station has shown an alternative use for the ash. By simply treating it with water in a special machine it can be made into pellets. These are then heated to red heat, the heat once again being largely supplied by the unburnt carbon contained in the ash, and so hardened that they are suitable for mixing with cement to make concrete blocks somewhat like the familiar breeze block. This discovery is important because supplies of the clinker used up to now are dwindling owing to the increasing use of pulverized fuel.

The Dearth of Technologists

Educational Aspects of a Serious Problem

By MARGARET TUCKER, B.A.

"IT is clear that the ability of the universities and the colleges of technology to carry out what is required depends very much on a change of climate relating to science and technology, and the improvement of facilities for teaching science at such (grammar and public) schools."

This passage is taken from section 6 of a "Memorandum on Public and Higher Technological Education" produced by the Parliamentary and Scientific Committee.* This same memorandum illustrates by its style and by its omissions and defects, more than by its obvious virtues, the inability of this nation at the moment to deal with a problem which, if neglected, will result in economic disaster in the near future. The report is competent, unassuming and tentative, and its readers must be comparatively few, yet it shows with alarming clarity that the downfall for which this nation is heading can be averted only by a change of attitude to science and technology in the whole country.

Industry is demanding more scientists and technologists than are leaving the universities and colleges of technology each year; but if British industry is to develop, still more technologists "trained and eager to apply scientific knowledge to practical ends"† must be demanded and employed by industry. The memorandum also comments on the fact that the number of technological personnel available per head of the population is approximately three times higher in the United States than in this country and that American productivity is about two-and-a-half times that of Great Britain. It also suggests that the demand for technologists will increase with the increase of productivity, as more technologists are employed by industry.

To meet the actual and later increased demand there must be more students of technology. But to-day "the capacity for university students in technology is not completely filled"; therefore more young men and women must present themselves for such courses from the schools. In all too many schools, however, science is in a parlous state. There is a drastic shortage of teachers and of facilities for teaching and, to some extent dependent on this, the demand for science at the sixth form stage is too small. Whilst this grave shortage of teachers continues, many would-be scientists are thwarted in themselves and lost to industry and to the schools as teachers.

Arts and Industry

Another aspect of this matter stressed in the Memorandum is the maintenance of the outworn tradition in so many of our grammar and public schools that the proper goal for all bright boys is a classical education, an arts course at the university and avoidance of anything to do with industry and factories. Yet an economic crash resulting from the dearth of technologists would bring down with it the walls of the ivory tower of classicism; and if the life of this nation is to maintain the integrity it knew in the time of the artist-craftsman this frightening dichotomy between the follower of the arts and the industrialist, the black-coated worker and the man at the bench, between the pure and the applied must be healed.

The problem is a national one in that the whole nation will suffer if it is not solved, but much more so because it reflects the confused thinking and poverty of our national life to-day. There are not sufficient teachers to prepare the number of students for the universities and technological colleges which industry and the schools require; nor are there in the country sufficient numbers of boys and girls studying or wanting to study for those requirements to be met. Yet we continue on the path on which we have found ourselves and delude ourselves that we are preserving absolute values in the face of the philistinism of applied science.

National Asset Wasted

Everyone who has worked with adolescents must know of their delight in mastering a technique, skill or craft and (their excitement) in questioning and seeking to understand something of the workings of the scientific age, whose manifestations are all around them. Yet in 1950 Sir Ewart Smith spoke of the shortage "of personnel trained and eager to apply scientific knowledge and scientific methods to practical ends." That shortage is more marked to-day. One of the most valuable assets of our nation is being wasted and the resulting disaster will not only be economic.

We owe it to these young people, as well as to our descendants, to show them how, in the realm of technology, that delight in a skill put to creative ends can further the tradition of British craftsmanship, which is likely to become an empty boast. Because it is not only they who must be shown, but their parents and often their schools, that this problem must be tackled nationally, industry, schools and colleges and all the machinery of administration of education in the United Kingdom must work together.

The most encouraging fact about the committee set up to consider the shortage of science teachers by a conference convened by the Federation of British Industries in January of this year was that all these groups were represented among its members. It seems a pity in view of the present system of conscription that the Services were not represented. It is certainly worth considering whether some courses in technology could not be studied during the period of national service, to the advantage of the student and of the nation.

The first necessity is to put before all the problem that is facing industry to-day and its relevance to the nation. It is true that the number of plaintive expressions of this problem has been great, but often they have been made to a closed circle who understood the problem anyway. Also mankind is blessedly immune to the plaintive. What we need is a full account of the emergency and an equally full account of the type of trained men and women required, as well as details of the courses of training offered and the grants available for those taking these courses. It is absolutely essential that three groups of people in particular should be possessed of this information: the boys and

* See *Electrical Review*, 30th July (p. 176).
† Spoken by Sir Ewart Smith and quoted by H.R.H. the Duke of Edinburgh in his presidential address to the British Association, 1951.

girls in the schools, their parents, and their teachers and local education committees.

All too often the bright grammar school pupil is influenced in his choice of career by the chance his father would have liked but did not have because of the lack of education when he was a boy. The report on the Shortage of Science Teachers, published in July, urges that the intelligent boy and girl should be encouraged to stay at school—advice which must fall strangely on the ears of many teachers who fight unceasingly but so often vainly to that end. It is most often not the child but the parent who must be won over, and to-day the teacher often feels himself to be fighting alone the world of commerce which offers quick financial relief to the fifteen year old's father who can only see any further training as an expensive hobby or for those living in a different world from his own.

The battle has often to be joined against that attitude of mind which rejoices in a grammar school place because such education will fit its recipient to work with "nice" people. This attitude leads to the choice of a career as a clerk or a comptometer operator as opposed to work of any sort in a factory largely, it would seem, because the former can keep cleaner hands.

Most teachers in State grammar schools, especially those in large towns or their immediate suburbs, know these attitudes only too well and do strive against them, but the battle is hard and it is largely fought in what many other professions would regard as out of work hours. The teachers' task would be lessened at the very least if there were a nation-wide campaign to recruit young people to the universities and the technological colleges to read science. We have the techniques and means of advertising, and if there is no, or insufficient, Government action then the industrial leaders must take on the task themselves.

At the same time full accounts of the opportunities for trained technologists and details of training should be sent to all schools so that staff and pupils may have an exact knowledge of them. Representatives from industry should visit schools so that they can talk direct to the pupils and their parents, but they should be people who can speak from exact knowledge; this is no time for vague exhortations.

Statement of Policy Needed

Apart from this campaign, an overall directive should be given by the Minister of Education to all colleges, schools and local education authorities concerning this problem. One of the advantages of the unwieldy and peculiar education system in England is that it does allow of devious routes being followed to one end, and full advantage of that fact should be taken here. There should be a definite statement of policy at the highest level and a pledge of support given in the working out of that policy which administrators, head teachers and their staffs should be given the freedom to do as may be best suited to the conditions peculiar to themselves.

Here the problem can be tackled regionally, and in this respect also the Memorandum is interesting in that it exposes, almost unconsciously, the unhappy uncertainty in the administration of education in this country between national and regional concerns. It makes several suggestions regarding technical colleges and the courses they might, and in some instances do, offer to those already employed by industry.

Then in paragraph 32 there is the statement "under such arrangements it should be possible for these technical colleges to work out arrangements for co-operating with universities in the same region. Such arrangements, for instance, do already exist at Manchester and Glasgow. Whilst, however, such co-operation should be encouraged it need not be regarded as essential and it may well be thought in some cases that it would be better for the technical college to stand on its own feet." Of course, but in the working out of this problem there can be no hard and fast rule and in other matters as well as those relating to colleges and universities different regions would be well advised to follow individual schemes.

What we need first is a general statement of Government policy and freedom, which implies the guarantee of financial support, given to the local authorities to work in conjunction with the universities, colleges and industry to the one goal. The apprenticeship system is worth more consideration here. It is a tried one and it might well be adapted at any rate to cope with an immediate need; and it has been proved conclusively that industrialists and educationalists can work together.

It is in the schools themselves that more aspects of this problem are met with. By far the most pressing is the shortage of science teachers and equipment for adequate teaching, and often muddled thinking in planning science courses. There is also the tendency I have already mentioned to encourage the average sixth form pupil to study the arts. If we are to escape disaster we cannot afford the luxury of nostalgia for an unreal past to colour our policy in schools. The opportunities offered by industry should be put before our pupils, and those who have no definite inclination for or outstanding ability in the arts as opposed to science and who tackle some form of course in applied science should be encouraged to do so. The Memorandum stresses the fact that is often forgotten that such training can well lead to management and other personnel and social work.

The arrangement of science courses in schools demands a clarity of thought which is all too often lacking. If grammar school pupils are to tackle a sixth form course in science which will fit them for a university or college of technology or for some form of apprenticeship in technology they need to have studied at least general science, or better, physics or chemistry or physics-with-chemistry to the standard of the ordinary level of the General Certificate of Education. The less gifted find it easier to cope with biology or general science, and such is our sentimental fear of being unfair to the less gifted that many schools offer only these two courses, which puts the sixth form science student at a serious disadvantage. It is true that in the past we have deprived the less fortunate of their chance, but we must not, through flabbiness, jeopardize the gifted in our desire to do well by the average or mediocre minds.

Science Teaching in Schools

The vital problem that confronts schools to-day is the shortage of science teachers and of adequate provision for science teaching. I have left this problem to the last because it is dependent on the fundamental problem of what the Memorandum calls the climate of our age and because the real answer to it, the recruitment of more students to the universities, can only bear fruit as far as the schools are concerned in, at the least, five years' time.

Meanwhile it is plainly the duty of local education committees to see that no would-be scientists are lost because of these shortages, and here again co-operation between schools, colleges and industry in small areas might well provide at least a short-term answer. Schools might well consider if they could pool their resources at least so far as sixth form science teaching is concerned. There are very obvious objections to this, but some such co-operation has already been proved possible and valuable, and objections fade into comparative insignificance beside the needs of the would-be science students and the national

interest. Head teachers should be prepared to consider such a plan with the local education authorities and heads of technical schools and colleges if they exist in the immediate neighbourhood. Some form of centre for the instruction of sixth form science students might help to solve the problem in areas where the shortage of teachers is especially acute. These measures are essentially regional as opposed to national ones, but there should be a policy of " lease-lend " between local education authorities and indeed between schools, colleges and industry.

Such co-operation might have a further result: the lightening of the load for the average science teacher whose burden nowadays is very heavy. The science teacher has a loyalty and a responsibility both to his subject and to his pupils. It behoves him at the very least to keep himself informed of the research and advances in his subject. This he must do in his spare time after teaching often in overcrowded laboratories with inadequate equipment, and often too with a small sixth form group in the small preparation room next door to which he turns his attention when his larger class can be safely left.

It is obvious that many young scientists will feel that they can serve their subject better in the context of industry than under such conditions in schools, and amelioration of such conditions will do much to achieve that increase in the prestige of science teachers for which so many of our select committees rather laboriously hanker. This circle too is vicious; until there are more teachers in each school these conditions must remain unless a courageous change in policy on the resources of schools is undertaken.

Again it is plainly iniquitous in view of the vital importance of teaching that the disparity between salaries to be earned by the scientist after promotion in industry and those earned by the experienced teacher is so great. The disparity is very clearly set out in the report on " The Shortage of Science Teachers." This situation cannot be remedied too quickly and must be remedied if this whole problem is to be tackled honestly and solved.

I believe, however (for such is the quixotic nature of the human race) that as many science graduates are deterred from teaching because they feel that they are likely to lose touch almost completely with scientific advances as are deterred by the shamefully low pay. Again co-operation between schools, colleges of technology, universities and research departments of industrial concerns might help to answer this problem.

Is it too much to envisage the research student giving some instruction to a sixth form group drawn from various schools, whilst the science teachers share something of the high disciplines of research? The practical difficulties are great and such schemes could only be brought into being by small beginnings between individuals. The important thing is that any suggestion which might serve the purpose of increasing the number of scientists or technologists should not be dismissed out of hand by administrators. Any co-operation between schools, colleges and industry would certainly help teachers to escape that sense of isolation that assails them so quickly when the doors of the university appear closed and the minds of IIIc more than usually well insulated.

T.U.C. GENERAL COUNCIL'S REPORT

From an Industrial Correspondent

THE General Council's report to the eighty-sixth annual Trades Union Congress, which opens at Brighton on Monday, is a staid and stolid document. Its sober language and commonplace phrases, however, hide many items of interest. Tucked away, for example, in the section headed " Industrial Policy and Organization," is an account of problems concerning the nationalized industries, with which the General Council has been called upon to deal.

A resolution remitted to the General Council from the 1953 Congress urged the development of a cheap and plentiful supply of electricity to the countryside, together with increases in capital expenditure and national uniformity of tariffs. The resolution was referred to the General Council's Production Committee which was of the opinion that the urgent national need to expand agricultural production as well as to improve the amenities of rural life provided strong justification for giving further attention to the rate of development. On capital development, the Production Committee expressed the opinion that " the constant attention given by the General Council to capital investment in the electricity supply industry largely met the requirements of the resolution."

Replies to a questionnaire sent out to affiliated unions with regard to joint consultation in the nationalized industries included one from the Electrical Power Engineers' Association which expressed the opinion that the attitude of managers and workers towards joint consultation had improved as a result of training courses and schools on the subject. Reporting back, however, was still not always adequate.

The 1953 report of the Select Committee on Nationalized Industries was considered by the General Council's Nationalized Industries Committee. It was " not convinced that a case had been made out for the appointment of a Standing Committee to examine and report on the nationalized industries." Adequate information was already available in the annual reports of the industries.

If the reader wants to know what came out of the dispute between the Confederation of Shipbuilding and Engineering Unions and one member of the General Council over the Confederation's " Plan for Engineering," he must pass on to the section on " Research and Economics." All he will learn, however, is that, having received no further communication from the Confederation, the General Council considered it impracticable to proceed with its examination of the engineering industry. In this section will also be found the General Council's generalized conclusion that " since 1951 incomes from rents, dividends and interest have been rising more rapidly than wages and salaries " and that " trade unionists cannot be expected to stand idly by while improvements they have secured are whittled away by action or inaction on the Government's part . . . ."

New Television Station

THE B.B.C. announced on Monday that, having received the Minister of Agriculture's consent, it would start construction immediately of a permanent television and v.h.f transmitting station at North Hessary Tor, Dartmoor. It was hoped that the television station could be completed by the end of 1955 and the v.h.f. transmitting station during 1956. In order to bring television to the area at an earlier date, the B.B.C. proposed to install a temporary station which would consist of a low-power mobile transmitter and a 150ft mast. The announcement added that the dates must be regarded as very approximate at this stage, since the speed at which construction could proceed would be greatly dependent on the weather on this exposed site.

Lamp Publicity

Material Available for the Autumn Campaign

THE lighting season is once again drawing near and lamp manufacturers have been busy preparing attractive new material and literature for use in showrooms and for window and counter displays. From examples we have already received it is apparent that dealers will have a wide range of material at their disposal.

Philips Electrical, Ltd., announces that its "Argenta" lamps will once more be the focus of its autumn advertising campaign. Extensive space bookings in women's magazines have been made. Showcards having a direct "tie-up" with the "homely" theme of these advertisements will also be available.

The life-size girl cut-out, "Philipa" is joined this year by "Miranda," a similar sales aid, but more suitable for shelf or counter display. A new Christmas pack for "Argenta" is also in production, and will be ready in time for Christmas sales.

For dealers in rural areas there is a new showcard for infra-red livestock rearing units. This is an attractive display-piece suggesting, by delicately blended tones, an atmosphere of warmth and comfort. A revised version of the booklet "Philips Infra-red Warming for Livestock Rearing" is now available, together with an up-to-date leaflet. "Photoflux" flashbulbs have a new counter display featuring a competition for amateur photographers. "Snaps" and the technical brochure "Perfection in a Flash" have also been revised. "Photolita" photoflood lamps, "Photocrescenta" enlarger lamps and Philips dark room lamps all have neat, descriptive showcards. A special projector lamp list is in course of printing.

The popular wall chart for motor car lamp bulbs is again available, with effective four-colour showcards for both motor car and cycle dynamo lamp bulbs. Electrical contractors and dealers will shortly receive copies of the latest Lighting Division catalogue. Enlarged for the fourth successive year, it now runs to sixty-four pages, listing and illustrating, with prices, the complete range of lamps and lighting equipment.

The Press advertising campaign of Ekco-Ensign, Ltd., is being backed up by a variety of striking sales aids, including four full-colour showcards. One item of special interest is a large counter and window display unit, designed to show the Ekco 2ft fluorescent batten fitting. A full range of literature on all lighting products is also available.

Above: The Philips "Miranda" life-size cut-out. Right: One of the Ekco-Ensign full-colour showcards

Co-ordination of Press and poster advertising with the sales effort of dealers is the keynote of "Osram" publicity by the General Electric Co., Ltd. Advertisements in the national and provincial papers and the women's magazines have been designed to appeal specially to the housewife. A new approach is being made to industry by advertisements in papers widely read by business executives. The lamp and moon poster design introduced last year is being retained and the same theme used in other forms. Also, the "little people" of last year's campaign are extending their activities and appearing in new situations. Another attractive display links up with the domestic side of the campaign by featuring an appealing framed black-and-white print of a baby's head and shoulders, with the slogan "Better Light for Precious Sight."

A G.E.C. window display which has the safeguarding of good eyesight as its theme

A new illuminated cardboard centre-piece for displays in smaller windows shows an open front door through which the housewife is seen standing in the hall. The "Silverlight" cut-out comparison unit is continued but with the addition of the "Osram" figures. The figures appear also on the day and night illuminated sign, in which the "Osram" slogan appears in red letters on a black background. This year the gilt frame has been dispensed with and the figures set off the sign in a more lively fashion. Designs of other cardboard material show a figure in a rocking chair, a carton in the centre of the cut-out profile of a lamp, and a clown balancing a lamp. New sales aids have also been produced for vehicle and cycle bulbs and G.E.C. photoflash bulbs.

Parts 1, 2 and 3 of the "Osram" catalogue have been revised for the new season. Guidance for users of fluorescent tubes is contained in a new leaflet with the theme of "Osram Tubes for Superb Quality and Stamina" and including notes on the selection of suitable colours for different applications from the whole range of "warm" and "cool" colour tubes. A small folder on the "Silverlight" lamp stimulates interest in good tungsten lighting practice among domestic users.

A valuable addition to literature on photographic lighting for the more advanced amateur and the professional is a new brochure "Better Pictures in Monochrome and Colour," which includes comprehensive data on a very wide range of modern synchronized cameras.

Australian Electrical Manufacture

Production of electric stoves and refrigerators in Australia during the first four months of 1954 was as follows: Stoves:—January, 2,310 (January, 1953—1,200); February, 2,670 (1,630); March, 3,860 (2,210); and April, 3,380 (2,310). Refrigerators:—January, 25,400 (17,370); February, 23,300 (18,300); March, 22,000 (13,980); and April, 18,400 (12,110).

OVERSEAS ELECTRICAL TRADE

Increased Exports to Many Markets

IN line with British exports generally, those of electrical equipment showed a satisfactory improvement in July, the total value of £15,869,456 being 11 per cent more than the monthly average for the second quarter of the year. There were increases in most of the main classifications, particularly transformers, switchgear, etc.; cable exports, however, remained much below last year's level. It should be borne in mind that there is usually a rise in deliveries in July before they are significantly affected by the summer holidays, and also that the month contained 27 working days compared with 25 in June, when electrical exports were valued at £13,765,860. The July figures show an increase over the corresponding month of last year of £105,325 and the aggregate for the first seven months of this year is up by £1,118,760. As cable and wire exports declined in the same period by nearly £7½ million, it will be seen that a considerable improvement must have taken place in other sections.

Exports of generating plant and electric motors in the first seven months of the year were greater in both volume (655,699 against 642,607 tons) and value (£18,262,027 against £17,743,925). Surprisingly, two foreign countries were the chief buyers in July, namely, Thailand, which took £265,511 worth, and the Soviet Union (£240,512). Exports of transformers during the month were valued at £1,280,509 compared with £822,430 in June, and those of switchgear £1,481,256 (£1,240,846).

Some quietness in sales of domestic radio receivers was to be expected in anticipation of the new models exhibited at the Radio Show, but this was amply covered by increased trade in other kinds of radio and sound reproducing apparatus. So far this year exports of this type have expanded by not far short of £3 million to a total of £15½ million, largely as a result of the demand for radio-communication and navigational aid equipment. The Netherlands and Sweden have been the chief buyers of British radio apparatus and, incidentally, the former has also been the principal supplier of electrical goods imported into Britain.

In the case of telegraph and telephone equipment, the value of exports this year has been slightly below that of last year, but there have been increases in purchases by

TABLE I.—ELECTRICAL EXPORTS

Class	July, 1954	Seven months ended 31st July	
		1953	1954
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW...	117,228	579,586	725,876
Ditto, 10 to 65 kW ...	165,100	1,078,810	1,119,897
Ditto, 65 to 200 kW	118,998	628,432	609,188
Ditto, over 200 kW ...	492,019	932,947	2,424,233
Spark gnition engine driven	15,981	171,552	127,481
Steam turbine driven	123,022	1,276,950	591,583
Other prime mover driven...	63,088	285,645	692,282
Generators	107,160	1,841,899	1,461,450
Parts of generators	274,030	3,469,442	2,670,234
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ⅛ h.p	223,953	858,973	1,294,448
Over ⅛ h.p. but under 1 h.p.	59,586	233,148	351,548
1 h.p. to 250 h.p.	419,142	2,796,111	2,799,008
Over 250 h.p.	105,062	601,493	925,764
Railway, tramway and trolley-bus motors complete and parts of all motors...	131,395	1,302,895	1,069,396
Motor starting and controlling gear	177,353	1,686,042	1,399,639
Converting machinery	73,845	282,468	241,145
Mercury-arc rectifiers	36,114	352,950	369,980
Transformers for lighting, heating and power (incl. coils)	1,280,509	7,240,477	7,417,328
Switchgear and switchboards (not telegraph or telephone)	1,481,256	9,704,687	9,398,426
Primary batteries:			
Lighting	69,924	406,545	470,557
Radio	155,411	624,896	1,032,431
Other	53,265	330,874	319,609
Parts (excl. carbons)...	48,575	146,634	374,842
Lamps:			
Filament, exceeding 24 V	101,291	453,868	542,377
Ditto, under 24 V	38,524	153,466	207,927
Discharge lamps, fluorescent tubes, etc.	64,995	268,109	426,743
Other lamps	16,672	116,093	182,073
Radio and television, etc., apparatus:			
Cathode-ray tubes	8,438	89,382	66,558
Other valves (not X-ray)	168,853	1,207,046	1,151,593
Radio and television transmitters	32,803	469,865	431,667
Commercial radio and radar equipment	1,265,022	5,105,711	7,239,863
Domestic radio receivers, mains	166,054	1,430,995	1,158,955
Ditto, battery	69,662	335,066	384,959
Ditto, other (incl. car)	16,704	111,406	85,509
Radiograms	49,049	298,214	266,282
Television sets	44,904	185,435	145,923
Public address equipment	60,939	354,350	423,305
Sound reproducing app., n.e.s.	22,850	101,442	161,015
Components and parts, n.e.s., incl. parts of valves and c.r. tubes	614,710	2,942,454	4,013,860
Telegraph and telephone installations	537,700	3,023,892	4,285,826
Telephone instruments, separately consigned	80,576	1,224,944	800,806
Telegraph and telephone parts	608,324	4,478,478	3,326,964
Line apparatus for long distance commun.	86,418	1,259,716	1,061,702
Cookers	129,006	315,138	529,608
Toasters	26,119	105,688	130,803
Other cooking apparatus	61,293	136,377	226,600
Parts and accessories	62,978	194,758	296,446
Space heating appliances	30,104	132,120	245,067
Water heating appliances	26,326	187,916	181,898
Other heating appliances	34,515	174,335	247,427
Parts and accessories	42,285	309,348	325,710
Irons	54,446	318,384	435,450
Arc welding equipment, a.c....	22,030	339,971	248,434
Ditto, d.c.	49,128	283,608	332,318
Resistance welding equipment	7,892	58,195	121,098
Magnetos, ignition	16,151	153,293	107,712
Sparking plugs...	161,909	823,882	1,032,135
Elec. appliances for aeroplanes, n.e.s.	180,231	976,940	1,371,298
Ditto, for motor vehicles, n.e.s.	269,338	1,212,500	1,668,490
Ditto, for cycles, n.e.s.	77,357	417,517	578,713
Signalling app. (incl. traffic signals)	26,611	446,821	371,304
Industrial radio-frequency equipment	14,592	95,433	147,830
Bell app. (not telegraphic or telephonic)	9,007	48,830	57,627
Instruments, commercial	169,660	956,318	1,064,642
House service meters (not prepayment)	115,421	572,417	839,046
Ditto, prepayment	14,209	65,447	108,096
Electro-medical apparatus (not X-ray)	45,879	265,889	322,827
X-ray apparatus (excl. tubes and valves)	54,469	418,402	338,415
Vacuum tubes	16,063	164,989	135,278
Desk fans	28,512	221,114	237,128
Ceiling fans	76,632	710,776	701,174
Vacuum cleaners	200,976	907,770	1,286,094
Floor polishers	115,852	461,049	790,061
Food mixers	60,494	274,605	343,328
Hair clippers and dry shavers	88,447	274,073	554,313
Other portable appliances	35,651	121,354	189,131
Parts	110,894	304,420	524,449
Portable elec. tools (not saws) and parts	187,389	984,098	1,108,632
Cables and wires:			
Telegraph and telephone, submarine	117,926	542,511	542,352
Ditto, other	373,520	5,381,368	2,509,658
Cotton, silk or art. silk insulated	45,054	445,918	282,421
Enamel, glass or asbestos insulated	73,189	646,483	488,164
Paper insulated	482,117	7,322,984	3,963,724
Rubber insulated	456,651	3,299,918	2,857,455
Other	272,611	2,131,355	1,715,259
Accumulators for motor vehicles	161,707	1,019,107	1,105,524
Ditto, traction...	19,152	113,278	167,936
Ditto, radio and other portable	66,289	285,785	246,989
Ditto, other	71,369	366,297	405,366
Parts and accessories	62,568	347,605	435,669
Elec. porcelain, etc. (incl. insulators)	93,515	574,618	634,981
Insulating cloth and tape	56,315	290,706	350,317
Other insulating material	80,344	425,548	521,802
Permanent magnets	56,036	204,657	287,403
Radio, telegraph and telephone testing equipment, n.e.s.	28,941	183,207	222,763
Scientific elec. instruments (not telegraphic or telephonic)	244,066	1,091,829	1,439,979
Electrical machinery, n.e.s.	82,500	585,345	842,010
Electrical apparatus and appliances, n.e.s.	557,216	4,056,719	3,842,555
TOTAL	15,869,456	103,192,401	104,311,161

TABLE II.—DISTRIBUTION OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	July, 1954	Seven months ended 31st July	
		1953	1954
	£	£	£
Channel Islands	71,064	292,989	383,696
Gibraltar	9,737	117,354	60,071
Malta and Gozo	17,144	171,778	330,322
Cyprus	50,379	302,373	460,208
Sierra Leone	128,419	205,200	208,541
Gold Coast	124,437	702,387	722,766
Nigeria	192,554	1,378,314	1,072,640
Union of South Africa	1,694,860	12,959,209	11,325,282
Northern Rhodesia	154,205	825,540	789,623
Southern Rhodesia	221,784	1,571,974	1,440,539
Tanganyika	83,388	364,316	417,040
Kenya	160,315	1,561,279	1,047,953
Uganda	44,436	493,001	457,298
Nyasaland	15,861	102,262	70,477
Mauritius	20,694	187,624	167,516
Aden	59,892	1,177,072	664,149
Bahrain, Qatar and Trucial Oman	107,322	696,481	870,843
Kuwait	99,642	1,021,051	955,841
India	1,510,195	11,782,831	9,201,171
Pakistan	373,547	980,722	3,462,665
Singapore	294,365	1,862,338	1,864,553
Federation of Malaya	214,835	1,912,483	1,571,794
Ceylon	138,157	1,052,825	884,990
British North Borneo	64,739	212,558	243,937
Hong Kong	224,740	1,334,588	1,168,582
Australia	1,558,118	10,844,648	10,671,329
New Zealand	896,430	5,446,884	5,694,955
Canada	822,763	5,266,540	4,151,830
Jamaica	89,404	440,381	468,172
Barbados	24,606	93,833	144,466
Trinidad	85,262	478,269	578,560
British Guiana	37,387	210,501	259,197
Anglo-Egyptian Sudan	104,921	777,362	721,029
Other Commonwealth countries	111,408	838,028	842,284
Irish Republic	348,688	2,123,949	1,951,662
Soviet Union	258,458	150,423	1,507,098
Finland	134,145	519,053	810,542
Sweden	452,812	2,303,736	2,583,821
Norway	338,051	1,709,627	1,790,833
Iceland	14,818	104,001	98,404
Denmark	139,746	686,351	1,250,342
Poland	14,933	753,718	513,745
Western Germany	174,708	557,124	839,428
Netherlands	582,613	2,837,149	3,946,695
Belgium	276,479	1,633,118	1,886,516
France	189,287	1,729,063	2,070,273
Switzerland	130,004	508,629	678,582
Portugal	196,727	834,599	1,547,287
Spain	150,029	1,853,740	1,564,090
Italy	304,449	1,262,394	1,704,487
Austria	33,277	298,283	476,373
Czechoslovakia	11,067	43,270	29,120
Yugoslavia	50,759	344,628	757,457
Greece	42,339	626,944	473,423
Roumania	3	1,056,284	1,665
Turkey	13,447	844,786	355,113
Netherlands Antilles	5,779	103,668	49,056
Belgian Congo	20,134	246,645	197,657
French Morocco	17,588	182,757	179,268
Angola	10,647	76,538	71,277
Portuguese East Africa	30,863	153,628	165,552
Syria	38,939	159,378	187,823
Lebanon	32,301	248,400	249,651
Israel	46,540	367,404	250,511
Jordan	17,313	171,990	150,387
Egypt	91,226	808,551	671,350
Libya	8,495	133,959	63,586
Saudi Arabia	60,270	315,520	396,127
Iraq	248,020	1,439,576	1,637,250
Iran	32,953	135,026	229,578
Burma	119,649	647,598	875,012
Thailand	339,858	957,388	1,192,303
Indonesia	49,809	528,290	302,339
Japan	34,318	301,692	266,952
United States of America	244,934	1,345,221	1,813,443
Cuba	18,332	134,325	145,165
Mexico	53,160	197,442	188,016
Colombia	170,202	404,025	534,533
Venezuela	103,006	1,116,366	1,107,290
Peru	20,648	250,390	237,589
Chile	18,471	213,952	201,759
Brazil	22,481	794,640	585,991
Uruguay	139,780	143,202	550,279
Argentine Republic	91,062	290,717	603,936
Other foreign countries	118,829	878,251	996,206
TOTAL	15,869,456	103,192,401	104,311,161

a number of countries including Portugal (from £193,005 to £478,117), Brazil (from £157,870 to £390,725) and Iraq (from £147,435 to £316,885).

The contraction in demand for wires and cables has already been mentioned. In July the value of exports was £1,821,068 against £3,252,626 in the corresponding month of last year, and the aggregate for January–July of £12,359,033 contrasts with £19,770,537 last year. The principal reductions have been in supplies to India (from £3,876,206 to £1,663,307), South Africa (from £1,862,882 to £976,367), Australia (from £1,740,082 to £917,063) and Roumania (from £1,037,325 to £842).

In addition to the machinery and apparatus listed in Table I and analysed according to destinations in Table II, the official returns include a number of other electrical items. Among these are washing machines, the July exports of which were valued at £420,578, making £3,220,999 for the seven months (against £2,277,130); electric locomotives, £235,722, making £1,506,270 (£2,069,187); and diesel locomotives with electrical transmission, £528,621, making £2,174,082 (£376,350).

Imports of electrical equipment in July (£1,647,580) were less than in June (£1,945,009), but the total for the seven months of the year, at £9,625,627, was £4,354,960 more than in the same period of last year. The principal increases have been in imports of radio apparatus (from £2,187,800 to £4,557,138), particularly in cathode-ray tubes (from £414,855 to £1,130,003). The bulk of the electrical imports this year have come from the Netherlands, £2,865,305 (£1,354,291), the United States, £1,757,397 (£1,226,459), Western Germany, £1,062,306 (£707,196) and Canada, £1,328,961 (£194,014).

British Standards Yearbook

THIS year's edition of the *British Standards Yearbook*, which has just been published, lists no fewer than 2,500 British Standards current at 31st March last, and gives a brief description of the subject matter of each. A comprehensive index simplifies reference. The usual information on the membership of the Institution's General Council, Divisional Councils and Industry Standards Committees is given, together with the names of representatives on the main Special Committees and Advisory Committees. Particulars of the work in hand of all the Industry Standards Committees are also given.

British Standards under which the Institution's certification trade marks are used are listed beneath the following headings: electrical; building; plastics; bedding and furniture; personal safety; miscellaneous. Containing over 500 pages and attractively produced, the book is essential to all those whose work demands that they keep up-to-date with the increasing momentum of practical standardization and simplification. Copies are available from the British Standards Institution, 2, Park Street, London, W.1, price 12s 6d.

Cable Ship in Collision

The new 3,300 ton cable ship *Recorder*, the largest and fastest in the Cable & Wireless fleet and the first British cable repair ship designed to handle the new deep-sea submarine repeaters, was badly holed in a collision with the 4,625 ton Danish motor vessel *Uruguay* in the Thames Estuary last week. The *Recorder* was bound for Charlton Buoys from the Tyne to load cable before making her maiden voyage to the Mediterranean on 15th September. Repairs are expected to take about six weeks.

I.E.E. Section Chairmen

Officers for the 1954-55 Session

IN a few weeks the meetings of the Institution of Electrical Engineers for the 1954-55 session will be in full swing in London and in the provincial Centres. Biographical notes and the portrait of the President, Mr. J. Eccles, who delivers his Presidential Address in London on 7th October, were given in our issue of 23rd July, and following our custom we now give brief notes of the chairmen of the specialized Sections and hope to deal similarly with the chairmen of the Centres and Sub-Centres in future issues.

MR. M. WHITEHEAD, chairman of the Measurements Section, is chief engineer of the Meter Department of Ferranti, Ltd., Hollinwood. He received his engineering education at Newton Heath Technical College, Manchester, and the Manchester College of Technology, gaining the Associateship of the College (A.M.C.T.) in 1926. The whole of his industrial experience has been gained with Ferranti, Ltd., whom he joined in 1928 as research engineer in the Meter Department. He was appointed chief meter designer in 1935 and to his present position in 1940, and in these capacities has been responsible for research, development, design and testing of electricity meters and associated equipment and gear, in addition to the technical and engineering features of production in a large mass production factory. He is a member of a number of B.E.A.M.A. committees, including the chairmanship of the Meter Technical Committee, and also of committees of the B.S.I., I.E.C., and E.R.A. At the request of the Minister of Fuel and Power and immediately before the appointment of the Clow Committee, he prepared a report on electricity tariff apparatus, and subsequently advised on instrumental aspects of the peak load problem. He has been active in the affairs of the I.E.E. as a member of various committees, including chairmanship of the North-Western Student & Graduate Section and of the North-Western Measurement Group.

Mr. M. Whitehead

Mr. J. I. Bernard

Mr. C. W. Oatley

Mr. J. D. Peattie

MR. C. W. OATLEY, M.A., M.Sc. (Radio Section) was educated at Bedford Modern School and St. John's College, Cambridge, where he took both parts of the Natural Sciences Tripos, specializing in physics. After two years in industry, he was appointed to the staff of the Physics Department, King's College, University of London, where he remained until 1939. During the war he was at the Radar Research and Development Establishment of the Ministry of Supply and in 1944-45 was in charge of the scientific work of this establishment. In 1945 Mr. Oatley was appointed to the staff of the Engineering Department of Cambridge University and was elected to a Fellowship at Trinity College.

MR. J. D. PEATTIE, B.Sc., F.C.G.I. (Supply Section) is deputy chief engineer (generation) of the British Electricity Authority. After early education in Scotland, he received his technical education at the City and Guilds College, London University. Following graduation, he went to Berlin and spent three years there with Siemens Schuckertwerke. On the outbreak of the 1914-18 war he joined the R.N. Division and was later commissioned in the Royal Engineers, serving at Gallipoli and in Europe and being mentioned in dispatches. Between 1919 and 1925 Mr. Peattie was engaged with the Metropolitan-Vickers Electrical Co., Ltd., and then with Edmiston, Brown of Glasgow. He joined the Manchester Corporation Electricity Department as electro-technical engineer in 1925 and in 1929 he was appointed operation engineer at the head office of the Central Electricity Board, becoming deputy chief engineer in 1944, and he has held this position at the British Electricity Authority's headquarters, for transmission (1947-49) and for generation to date.

MR. J. I. BERNARD, B.Sc.Tech., M.I.H.V.E. (Utilization Section) has been associated with the British Electrical Development Association since 1927, latterly as chief technical officer. He was educated at Seafield School and Brighton College, and gained an honours degree at the College of Technology, Manchester. His practical training was received with the British Westinghouse Electric & Manufacturing Co., and the British Thomson-Houston Co., Ltd. After service in the 1914-18 war with the R.E. Wireless Section in German East Africa, he was engaged in industrial electrification advisory work with the British Engine, Boiler & Electrical Insurance Co., Ltd., specializing in textile mill, steelworks and factory installations. Later he joined the staff of the Electricity Commission, dealing with engineering aspects of applications for sanctions for power stations, bulk supplies, overhead lines and extensions of distribution systems. As chief technical officer of E.D.A. he is responsible for the technical side of advertising and publicity, including articles and booklets on a wide range of subjects concerned with domestic, rural and commercial applications of electricity. During the last war he assisted Government Departments, particularly the Ministry of Fuel and Power and the Ministry of Works, with fuel efficiency campaigns and post-war building study committees. Mr. Bernard is a member of the I.E.E. Post-War Planning Committee on Electricity Supply, Distribution and Installation, a member of the Wiring Regulations Committee, and a founder-member of the Committee of the Installations (now Utilization) Section. He is a member of a number of E.R.A. and B.S.I. committees and joint secretary of the E.D.A./B.S.I. Advisory Committee on Electrical Appliances and Accessories.

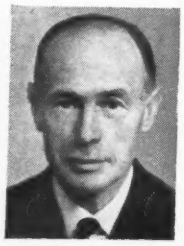
"ELECTRICAL WHO'S WHO"

The new edition of our "Electrical Who's Who" is now available. It contains about 5,000 brief biographies of men and women in all branches of the electrical industry and profession. An addition is an index of companies, Electricity Boards, Government Departments, etc., under which the entries are classified. The price is 21s (postage 8d)

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Council of the British Institution of Radio Engineers announces that **Rear-Admiral Sir Philip Clarke,** K. B. E., C. B., D.S.O., is to be the next president of the Institution. Educated at the Royal Naval Colleges, Osborne and Dartmouth, Sir Philip commenced regular service in 1914. After the 1914-18 war, and further study at Christ's College, Cambridge University, he served overseas as torpedo officer, and, on appointment as commander in 1932, joined the staff of the Tactical School. Following appointments with the Home Fleet and the South American Squadron he was promoted to captain in 1938. As commodore and senior naval officer, Red Sea and Aden, he was mentioned in despatches and in 1941 was appointed deputy director and subsequently director of the Anti-Submarine Warfare Division. From 1943 to 1946, he was in command of H.M.S. "Glasgow." Whilst Director of Manning at the Admiralty, he was promoted to Rear-Admiral, subsequently serving on the Eastham Manpower Committee and then as Admiral Superintendent, Malta. He was appointed to his present post of director of the Naval Electrical Department in 1951. He has been a vice-president of the Institution since 1952.



Rear-Admiral Sir Philip Clarke

Mr. S. M. Hill, A. M. I. E. E., M.I.Mech.E., F.Inst.F., will be relinquishing his appointment as generation engineer (operation) of the South Western Division, British Electricity Authority, on 31st October, following a period of extended service beyond his retiring age. Mr. Hill's association with the Division will not be severed as he will continue for a time in a consultative capacity on operational matters associated with the construction of the Portishead "B" power station.

Mr. S. M. Hill

Mr. Hill, who was appointed to his present post at vesting date, has been responsible for the power stations in the northern area of the Division. He was from 1929 to 1948 station superintendent at Portishead and went there following ten years' service with the Lancashire Electric Power Co. He was, before the 1914-18 war, in which he served in the Royal Navy, for some years in South Africa with the Victoria Falls Power Co., and also had short periods of service with Birmingham Corporation and Norwich Corporation. **Mr. P. L. Lutte,** who is at present generation engineer (operation) at Plymouth, in charge of the southern group of stations, will transfer to the northern area, and will take up his duties there on 1st November.

The following new appointments have been announced by the North Eastern Division, British Electricity Authority:—Power station superintendent at Stella South, **Mr. W. F. Cusworth,** B.Sc., A.M.I.E.E.; power station superintendent at Dunston "A" and "B" and Blaydon, **Mr. T. E. Loraine,** A.M.I.E.E.; superintendent at Stella North, **Mr. C. R. Garnett,** B. Sc. (Eng.), A. M. I. Mech. E., A.M.I.E.E.

Group Captain R. C. Richmond has been appointed to the London office of Marconi's Wireless Telegraph Co., Ltd., for duties in connection with its aeronautical radio business. His office will be in Marconi House, Strand, London, W.C.2. Group Captain Richmond was educated at Westminster School and the City and Guilds (Engineering) College. He joined the R.A.F. in 1929, and took the specialist signals course. Among appointments he held during the war were chief signals officer, West Africa, Coastal Command, and Air Defence of Great Britain. Before retiring, Group Capt. Richmond was commanding officer of No. 2 Radio School, Yatesbury.

Group Captain R. C. Richmond

The Minister of Transport and Civil Aviation has appointed **Mr. A. B. B. Valentine** as a full-time member of the British Transport Commission and **Lt.-Col. D. H. Cameron of Lochiel** as a part-time member.

Mr. H. W. Smale, who took charge of the new service centre of the South Western Electricity Board at Electricity House, Bristol in 1948, is retiring this month.

The following appointments are announced by the British Driver-Harris Co., Ltd.:—General manager (Cheadle works), **Mr. A. Clark;** works manager, **Mr. J. H. Ireland;** assistant works manager, **Mr. J. L. Cooper;** and foundry manager, **Mr. H. McLeavy.**

After thirty-four years' service with the Northmet Co. and the Eastern Electricity Board, **Mr. A. Phillips,** district commercial engineer, Enfield, Eastern Electricity Board, retired on 31st August. He went to Enfield as sales engineer in 1920 shortly after his demobilization from the army, having served for about five years in the Royal Engineers. He started his career with the Twickenham and Teddington Electricity Supply Co. at Teddington in 1903, leaving there in 1913, to take up an appointment with the Croydon Corporation as assistant consumers' engineer. In 1914, he joined the Cornwall Electric Power Co. at Carn Brea as assistant engineer, and early in 1915 enlisted in the Cornwall Fortress R.E. Searchlight Co. at Falmouth, serving for about four years in France chiefly on installations and supply work for camps, hospitals, workshops, ammunitions dumps and G.H.Q.

Mr. A. Phillips

Sir Claude D. Gibb, chairman and managing director of C. A. Parsons & Co., Ltd., has left England on a six weeks' visit to Canada, the United States and Australia. Sir Claude will be a member of the British delegation at the conference at Philadelphia of the International Electrotechnical Commission. On 27th September he will attend the official opening by the Prime Minister of South Australia of Parsons' new works at Whyalla, South Australia.

In our issue of 6th August we reported the appointment of **Mr. A. N. Todd,** A.C.A., as chief accountant of the London Electricity Board. We now reproduce Mr. Todd's portrait.

Mr. A. N. Todd

Mr. C. Watson, for many years chief sales engineer of the British Ermeto Corporation, Ltd., Maidenhead, has been appointed a director of the company.

The Minister of Fuel and Power has appointed **Mr. K. T. Spencer,** C.B.E., M.C., B.Sc.(Eng.), F.R.Ae.S., A.M.I.C.E., to be chief scientist in succession to Sir Harold Roxbee Cox.

Mr. Michael Amberg, who has just returned from the Empire and Commonwealth Games at Vancouver, won a gold medal for the individual sabre as a member of the English Fencing team which gained five gold medals which his father, Mr. V. H. C. Amberg, is a sales engineer in the Westminster office of the Express Lift Co., Ltd., of which his father, Mr. V. H. C. Amberg is managing director. Last year, at the age of twenty-seven, he was the British open sabre champion.

Following the successful function held last year the London and Western Section of the **Electrical Wholesalers' Federation** is organizing a dance at Londonderry House, Park Lane, W.1, on 24th September, in aid of the Electrical Industries Benevolent Association. The dance will be held on a larger scale than last year, and all members of the electrical industry are invited to attend. Tickets, which are limited, may be obtained from Mr. R. W. Holledge, the Stearn Electric Co., Ltd., 31, Vauxhall Bridge Road, S.W.1, price 32s 6d each, including a buffet supper.

The final of the **Electrical Industries National Golf Championship** will be played at Moor Park, Rickmansworth, Herts, on 4th October. The programme in the morning on the high course will be the final of the 18 holes medal round for the Sir Montague Hughman Trophy, the runner-up prize presented by Mr. J. L. Wilson and the best scratch score prize presented by the late Mr. J. Y. Fletcher. There will also be an 18 holes medal competition (all day) for the veterans' trophy presented by the proprietors of the "Electrical Journal." This is open to any golfer of 55 years of age and over who is connected with the electrical industry. The entrance fee is 5s. On the west course there will be an all day 18 holes medal competition for the visitors' rose bowl presented by the Electrical Wholesalers Federation (entrance fee 5s). The golf club charges are £1 per day, including coffee on arrival, lunch, green fee, tea and staff gratuity, or 10s 6d exclusive of coffee and lunch. This year's dinner will be held at the Park Lane Hotel, London (tickets 27s 6d each, exclusive of wine). Tables may be reserved for parties of eight, ten or twelve persons. Entry forms and dinner tickets can be obtained from any area secretary or from Mr. Frank Farthing, Magnet House, Kingsway, London, W.C.2.

We are asked to remind our readers that the annual general meeting of the **Electrical Industries Benevolent Association** will be held on 22nd September at 11 a.m. in the Council Room of the Institution of Electrical Engineers, Savoy Place, London, W.C.2.

In a **Midlands Radio Industry Golfing Society** four-ball alliance match at Little Aston (Birmingham), the winners were Messrs. C. A. Jenkins and J. A. Lloyd, with a net 74.

We regret that owing to a printer's error the date of the general meeting and supper of the **Electrical Trades' Commercial Travellers' Association** was incorrectly given in our last issue. This event will take place on Friday, 10th September.

OBITUARY

Mr. F. W. Woodfield, B.Sc., A.M.I.Mech.E., M.Inst.F., manager of the Manchester office of Babcock & Wilcox, Ltd., died on 23rd August at the age of sixty. Mr. Woodfield was a past chairman and member of the Technical Advisory Committee for the Fuel Efficiency Exhibition and an active member of the Engineers Club. He joined Babcock & Wilcox in 1929 and was appointed to the Manchester office in 1935. He was for many years a director of Erith's Engineering Co., Ltd.

WILLS

Mr. K. J. Noble, director and secretary of the International Electrical Association, formerly representative of the Export Department in London of the British Thomson-Houston Co., Ltd., who died on 10th May last, left £23,178 gross (£23,118 net).

Mr. L. W. G. Russell, A.M.I.E.E., meter and test superintendent, Northern Sub-Area of the London Electricity Board, who died on 13th May last, left £5,250 gross (£4,220 net).

Mr. F. A. Willcox, director of J. & E. Hall, Ltd., who died on 7th May, left £48,841 gross (£48,744 net).

Mr. H. J. M. Stirling, electrical engineer, Prince of Wales Drive, S.W.11, who died on 12th June, left £26,601 gross (£26,360 net).

Mr. W. F. Marsh, production director of the British Driver-Harris Co., Ltd., who died on 20th May, left £21,795 gross (£21,466 net).

Mr. H. D. Wilson, of Torquay, formerly a director of the Sifam Electrical Instrument Co., Ltd., who died on 23rd June, left £666 gross (£614 net).

Mr. G. Burney, founder and first chairman of the Telephone Manufacturers' Association and managing director of Sterling Telephone and Electrical Co., who died on 17th March last, left £767 gross (£710 net).

Mr. F. Hulme, managing director of F. Hulme & Co., Ltd., Manchester, who died on 23rd June last, intestate, left £6,820 gross (£6,305 net).

Mr. J. H. St. Hill Mawdsley, M.I.E.E., late of Mawdsley's, Ltd., who died on 24th April last, left £30,598 gross (£30,492 net).

Fatality at Substation

While investigating a fault at a substation at Leighton Buzzard last week, Mr. Marcus Michael Andrews (41), of the Eastern Electricity Board, came in contact with a live wire and was killed.

Southport Flower Show

One of the attractions of the electricity stand at the recent Southport Flower Show were two tomato plants measuring between 15 and 16ft, which had been brought to Southport from the North Western Electricity Board's horticultural testing station at Kendal, Westmorland, by Mr. R. Marshall, the Board's horticultural officer. These were taken from a batch of plants which had been propagated on an electrically warmed bench with the aid of mercury vapour lighting, and grown in steam sterilized electrically warmed old tomato soil under good natural light conditions in a glass-to-ground house. The commercial glasshouse was the main feature of the exhibit, organized by the Merseyside and North Wales Electricity Board in association with the North Western Electricity Board and the Electrical Development Association. On the afternoon of the opening day visitors were passing through it at the rate of about 1,200 per hour. The Merseyside and North Wales Electricity Board entertained a number of the leading growers to luncheon in the Royal Hotel, Southport, on the first day of the Show. Mr. P. Bregazzi, manager of the Board's Liverpool Sub-Area, who presided, thanked the growers who had assisted in the preparation of the electrical exhibit. He said that this was perhaps the beginning of a close association between the electrical industry and the horticultural industry in that part of the country. Mr. Bregazzi paid tribute to the valuable assistance rendered by Mr. Marshall of the North Western Electricity Board.

Works Buildings and Services

A refresher course on works buildings and services for senior works and plant engineers commences at the Nottingham University on 19th October. Each paper will be given by specialists drawn from industry, and will be followed by a period for discussion. Advance copies of most papers will be supplied for inclusion in a specially prepared folder. The fee for the full course is £5 5s. The syllabus, designed to promote the application of modern techniques in works engineering practice over a wide field, includes the following subjects: Lighting, heating, ventilating and air conditioning, electricity services, financial implications of plant installation, costing of services, materials handling, factory planning, layout and architecture, safety precautions, industrial effluents problems, and planned maintenance. The hon. secretary to the course, from whom all information can be obtained, is Dr. H. K. Lloyd, Departments of Civil and Mechanical Engineering, University of Nottingham, University Park, Nottingham.

Engineering in Europe

Abstracts from Foreign Technical Journals

ON short transmission lines, where the sending-end impedance is at all loadings large compared with the input impedance of the relays when fault conditions obtain, simple impedance relays are quite satisfactory. However, even with medium-distance lines the independence of protective relays of the loading conditions represents a major problem and, even more, with really long lines transmitting heavy loads. The author suggests a solution of this problem in the form of a relay of elliptic characteristic (detector-type relay) by which the protection may be rendered fully independent of the sending-end impedance of the lines under normal conditions of operation and also under voltage oscillations. This makes this type of relay suitable to serve as starting element of the system protection of long and heavily loaded lines.

The basic parameters of these relays, viz. operating voltage at maximum sensitivity, power consumption, response time, etc., are more satisfactory than those of induction, electromagnetic and other types of relays. However, the numerical eccentricity of the elliptic characteristic must not be exaggerated, because this makes the relay more sensitive to the transient fault resistances. This is less serious in the case of long than of short lines because the influence of the transient resistances is in itself far less marked in the former case. Although the full theory and design data for the relays are presented, practical experience with them is not yet available. It is also clear that the basic circuits presented are capable of considerable improvement.—" Distance Protection of Long and Heavily Loaded Transmission Lines," Yu. A. Gaevenko, *Elektrichestvo*, No. 6, pp. 8–13, 1954, in Russian.

S.C. Motor Heating

The (German) regulations do not contain concrete data on the permissible temperature rise of squirrel-cage rotors with bare conductors except for the statement that their temperature (and that of the rotor core) must not overstress thermally the neighbouring insulations. It is very difficult to get a reliable estimate or even experimental data on the actual temperature rise and mechanism of heat rejection of, particularly, die-cast or extruded, aluminium squirrel-cages, since the design of the motors permits only of heat conduction or rejection. Obviously the problem is different for open (ventilated) and totally enclosed (surface-cooled) types. The former can only have radial fan blades, since commercial motors must have a reversible sense of rotation. The manometric efficiency of such fans is necessarily low. However, the author shows how to calculate the pressure head of the fan, the air speed induced by it in the air gap and ducts of the motor, and hence the cooling air volume forced through the machine at a given speed from basic hydrodynamical formulæ. This is accurate enough for proving that the air convection cannot materially contribute to the removal of the current heat produced. This means that the heat is carried off only by conduction. The remaining problem is then again treated in the simplest possible way, viz. by considering the heat flow as analogous to electric current processes and using analogues of Ohm's and Kirchhoff's laws. The calculation is carried out for open and closed motors, on which temperature measurements had been carried out with the best accuracy obtainable. The agreement of theory and experiment is very satisfactory, both showing that the temperature rise remains well within permissible limits.—" Temperature Rise of Squirrel-Cage Rotors," F. Unger, *E.T.Z.* (*A*), Vol. 75, No. 10, pp. 332–335, 11th May, 1954, in German.

Instrument Transformers

V.h.v. instrument transformers may be of two types, viz. the " pot " or " tank " type and the bushing type, the latter being the more modern type and more suitable for rail and road transport in a condition ready for service. The author describes modern design principles of current and voltage transformers, discussing the problems of insulation, field control, uses of the inductive or capacitive types of transformer and also the possible combination of current and voltage transformers in a single unit. As an interesting application of the principles expounded, the current transformers supplied by German firms for the Swedish 380 kV system are described in all their essential and novel features and compared with the equipment built by Swedish firms. The Swedish regulations for V.h.v. plants, being more severe than the German regulations where testing voltages are concerned, had to be complied with and the breakdown strength of the internal insulation consisting of impregnated cable paper had to be kept far above the flashover voltage of the transformer. The maintenance of this very high insulation level required hermetic sealing of the whole unit which was provided by special bellows-type seals. Precision of measurement, short-circuit behaviour and thermal characteristics are also satisfactory, as evidenced by the given test results. It goes without saying that the transformers are equipped with separate cores for actuating the system protection.—" Instrument Transformers for V.H.V. Systems," H. Ritz, *E.T.Z.* (*A*), Vol. 75, No. 9, pp. 307–312, May 1954, in German.

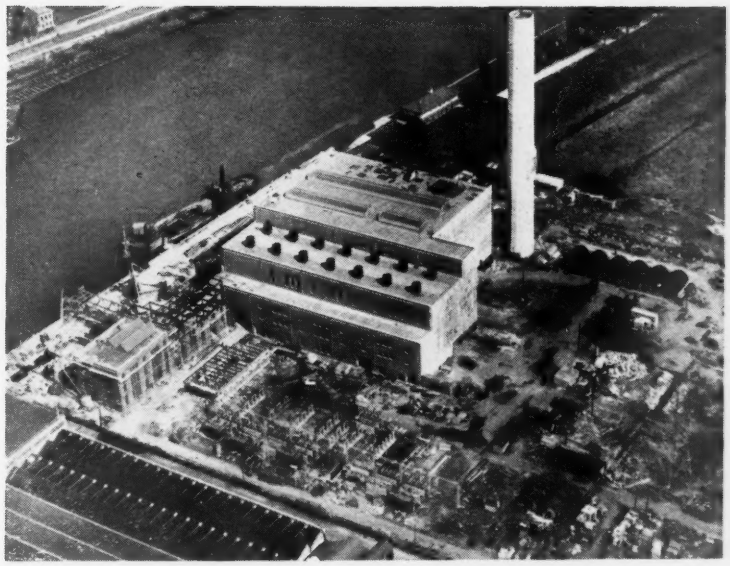
Power Factor Correction

In France consumers of electric power whose installations work at a bad power factor are penalized by law by additional charges imposed from $\cos \phi = 0{\cdot}86$ and rising to 100 per cent for $\cos \phi < 0{\cdot}3$. There is therefore particular interest in p.f. improvement with its added advantages of reduced temperature rises and improved voltage constancy or, alternatively, increase of the installed power (for equal temperature rise). The author presents a balanced consideration of the various possibilities of compensation by shunt capacitors (centralized and individual) particularly of transformers and h.v. induction motors.

The automatic control of the capacitor banks by relays of VAr-meter, voltmeter and phasemeter types is described in detail, with reference to equipment produced by the firm of Alsthom (types from 22·5 kVAr/220 V up to 480 kVAr/5 kV). Clear performance diagrams of the various types of relays enable the relative merits of each type in application to concrete cases to be seen. An appendix gives convenient nomograms for the rapid determination of the percentage reduction of the active losses achievable by a chosen compensation factor and of the possible gain in transmitting power by inserting a capacitor bank of a given rating.—" Power Factor Improvement by Shunt Capacitors," A. de Freitas, *Rev. Alsthom*, No. 97, pp. 27–44, April-May-June, 1954, in French.

Irish Fuel and Power Resources

Plans to Double Generating Plant Capacity



Aerial view of the Marina power station, Cork

BEFORE the last war the bulk of Ireland's electricity was obtained from the Shannon hydro-electric scheme. With the growing electrification of the country increased use had to be made of coal and oil fired plant and by 1950 more than half the total output was derived from these imported fuels. Then came the successful commissioning of the first peat fired station at Portarlington and thus once again the country's power supplies are now largely obtained from indigenous resources. The present total plant capacity is 382 MW and the Electricity Supply Board's five-year programme of construction is designed to add a further 386 MW of which 180 MW will consist of peat fired plant, 41 MW hydro-electric and 165 MW coal or oil fired plant.

Further tests of the underground conditions at the site of the dams for the Avonmore River development project, Co. Wicklow, have been completed and it is hoped to have a final report on the project completed soon. The feasibility of the hydro-electric development of the Cummeragh River, Co. Kerry, has been under consideration and a preliminary scheme for the hydro-electric development of the Torc Waterfall, Co. Kerry, prepared in 1944, has been reviewed in the light of present day costs. Preliminary investigations have also been in progress on the economies of hydro-electric development on the Flesk River, Co. Kerry.

Increased Output

From the Board's report for the year to 31st March last it is learned that while the rainfall and inflow to the storage lakes were somewhat below average, they were more favourable than in the preceding year. The total number of kWh generated at the Board's stations increased by 131 million (11·3 per cent) to 1,292 million, the output from the hydro stations being 533 million kWh and from the thermal stations (peat, coal and oil fired) 759 million kWh. The output from the Portarlington and Allenwood stations was again very satisfactory through the availability of large quantities of peat. The report states that the generating plant in commission, and under construction, is adequate to meet all demands.

The extension to the oil-fired station at North Wall, Dublin, which added 32 MW to the system, was completed and one of the two 30 MW sets at the new Cork (Marina) station, using oil or pulverized fuel, was placed on test. Work at present proceeding on the stations at Cork, Ringsend, Ferbane, Lanesborough, Cliff and the Lee when completed will add 267 MW.

FUEL AND POWER COSTS

Station	Million kWh sent out	Fuel used, tons	Cost per ton	Fuel cost per kWh s.o.	Gen. cost per kWh s.o.
Shannon H.E. ...	278	—	—	—	0·344d
Erne H.E. (2 stations)	215	—	—	—	0·381d
Liffey H.E. (3 stations)	33	—	—	—	1·097d
Portarlington—peat	142	178,600*	50/11	0·768d	1·119d
Allenwood—peat ...	183	219,900*	57/2	0·824d	1·182d
Pigeon House—coal	261	211,400	89/3	0·866d	1·338d
North Wall—oil ...	122	46,300	145/2	0·661d	0·939d

* Equivalent standard fuel: actual fuel used 185,500 tons, 32·2 per cent moisture content, at Portarlington and 239,300 tons, 34·8 per cent moisture content, at Allenwood.

The sales of electricity developed in accordance with the long-term estimates, and in the year produced a revenue of £8,500,000. This was an increase of £900,000 compared with the preceding year. Of this growth, £400,000 came from areas under the rural electrification scheme. The revenue under this scheme was £1,400,000, or approximately 17 per cent of the total revenue. The basis of the two-part tariff for domestic consumers was altered from rateable value to the number of rooms for the purpose of achieving greater uniformity.

Having made full provision for interest, repayment of advances and plant renewal, there was a surplus of £233,209. Profits on merchandise and installation trading increased the surplus to £242,667. A sum of £200,000 has been transferred to increase the contingencies reserve fund to £700,000, leaving £61,412 to be carried forward. Since the commencement of the rural electrification scheme capital subsidies totalling £4,000,000 have been received from the Minister for Finance. By reason of the delay in the enactment of legislation, however, subsidies for rural development were temporarily not available and in consequence the interest charge to the rural account during the year was exceptionally high. The Electricity (Supply) (Amendment) Act, 1954, now authorizes direct borrowing by the Board.

New consumers last year numbered 33,590, bringing the total to 435,985.

Rural Development

Sixty new rural electrification areas were completed, raising the total to 289; 3,769 miles of rural transmission lines were constructed and 20,323 new consumers served, making the total number of rural consumers 101,318. Early in June, 1953, it was decided to increase the rate of development under the scheme by 50 per cent. Additional materials were placed on order, extra staff was recruited and trained, and the design and survey of new areas were undertaken. By October the full increase of 50 per cent was achieved and at the close of the year work was proceeding at the rate of seventy-five areas per annum. It is intended to increase the annual rate of construction during the current year to 100 areas. The 343 areas completed, under construction or selected for development, cover 8,903 square miles; this represents some 43 per cent of the total area of

the country, excluding waste or very sparsely populated regions. Supply is now available to 36 per cent of the rural population. The proportion of dwellings connected in the completed areas is approximately 67 per cent. The use of electricity for domestic purposes still accounts for the greater part of the consumption in rural areas. In addition to the smaller appliances—irons, radios and kettles—larger equipment such as cookers, waterheaters and washing machines, are being installed in steadily increasing numbers.

An investigation of the utilization of electricity showed that in some of the better developed areas the percentages of consumers using different kinds of electrical appliances were as follows:—Mains radio sets, 79; irons, 64; electric kettles, 44; cookers, 25; fires, 22; washing machines, 17 and wash boilers, 17.

Capital expenditure during the year amounted to £2,622,726 and the total invested in the scheme at 31st March, 1954, was £9,659,433. Sales of electricity amounted to 127 million kWh, or 47 per cent more than in the previous year. The revenue earned was £1,406,000, 2·65d/kWh.

Joint Consultation

Review of Progress in the Electricity Supply Industry

THE machinery for joint consultation in the electricity supply industry comprises the National Joint Advisory Council, fifteen District Joint Advisory Councils and 450 Local Advisory Committees. Their activities during 1953–54 are reviewed in an illustrated report just published, which shows that a wide range of subjects was discussed and much valuable work done.

During the year the N.J.A.C. made twenty-four recommendations to the Electricity Boards, bringing the total since it was established in January, 1949, to 107. These were concerned with training schemes for supervisors, accountants, linesmen, welders of high pressure vessels and pipes, building trades apprentices and canteen staff; the marking of fire-fighting equipment; recording sickness absence; establishment of benevolent funds for manual workers; and the holding of regional conferences on joint consultation this autumn. Other matters of inetrest and importance to the progress of the industry and the well-being of its employees that were discussed included, for example, the amalgamation of the Merseyside and North Wales and the North Western Divisions, and the proposal of the B.E.A. to close certain thermal generating stations of less than 1 MW capacity.

The progress of the District Councils appears to have been somewhat uneven. In general they did not themselves originate many subjects for discussion but considered numerous matters referred to them by the N.J.A.C. and the L.A.C.s. Useful work was done in furthering the development of the L.A.C.s and in impressing on them the need for widening the scope of their work. It is emphasized that although the District Councils receive the minutes of the L.A.C. meetings, the recommendations in them, addressed to local managements, are not subject to D.J.A.C. approval and can be implemented as soon as accepted by the management.

Probably the most important section of the report is that relating to the Local Advisory Committees. These committees met at least bi-monthly and many monthly. Progress was most marked in the fields of safety and efficiency. There was evidence, the report states, that many L.A.C. chairmen realized that joint consultation was a valuable aid to good management and that they were approaching the work of their committees accordingly. Courses in joint consultation were again held at Electricity Hall, Buxton, and Horsley Towers, Surrey, the eighteen arranged during the year being attended by 416 members, making 81 courses with an attendance of 1,907 since the first was held in 1950. At least 60 L.A.C.s now regularly produce newssheets compared with 30–40 a year ago. Virtually all the committees dealt regularly with some aspect of safety, after which efficiency was the subject most frequently discussed, such as the plant overhaul programmes, provision of suitable tools and equipment, the siting of station stores and use of station transport, increasing sales of appliances to consumers, improved methods of handling equipment and ways of preventing waste. The report stresses the importance of L.A.C.s informing local employees about education and training facilities (particularly the various educational incentives) and considering in detail the local implementation of National and District Council recommendations on education and training accepted in principle by the Electricity Boards.

In addition to including many examples of the work of particular Councils and Committees, the report refers to the working of the British Electricity Scholarship Scheme and the employees' suggestion scheme; the manner in which the report of the U.S. Productivity Team on the British electricity system was dealt with on the Advisory Councils and Committees; and the methods adopted by the Councils and Committees, particularly the L.A.C.s, to arouse interest in the work of the industry and in joint consultation among employees generally. This last subject is one of the most intractable problems which confront industry and joint consultative bodies everywhere. It is stated that about 250 local meetings of employees were held, most of them organized by the L.A.C.s. Most were apparently successful, not the least so those organized in the evenings; 275 employees attended one such meeting. It is clear that further development of these meetings is expected this year and that, quite rightly, much importance is attached to them.

Photographs in the report illustrate improvements introduced as a result of discussions within the advisory machinery as well as examples of publications and posters issued for the information of employees. Copies of the report, which could be profitably read by anyone interested in ways and means of dealing with problems of human relations in industry, may be obtained on application to Mr. R. D. V. Roberts, Secretary, National Joint Advisory Council of the Electricity Supply Industry, Winsley Street, London, W.1.

Australian Import Policy

(*From a Correspondent*)

The settled policy of the Australian Federal Government is gradually to replace import licensing controls (except those on dollar trade) by the more conventional and constructive policy of protective tariffs. Applications for increase in tariffs have been very heavy of late, and covered electric cable and wire, motor vehicle parts, record changing devices, vacuum cleaners and vacuum cleaner parts are among the items now listed for inquiry. Nevertheless, many Australian manufacturers continue to press for further controls, but the Prime Minister (Mr. Menzies) says: " Nothing in recent overseas trade figures leads me to expect that the re-imposition of import controls will be necessary in the near future. Rising imports, following relaxation of import controls, should occasion neither surprise nor alarm. Such rises were foreseen when the Government decided to relax the controls, but it is the business of manufacturers' spokesmen to seek the re-introduction of such controls."

VIEWS on the NEWS

By REFLECTOR

HAMS Hall is a familiar name to electrical men but I suppose to most of them it merely means power generation. They probably do not know that it was where the " Hams Draft " of the New Zealand Constitution was worked out in 1850—I myself did not know until I read it recently in the *Birmingham Mail*. Apparently Hams Hall still exists although it will not be found anywhere near the power stations. After the first world war it was taken down by a shipping magnate and re-erected at Coates, Gloucestershire; it cost him £82,000. But it later changed its name as well as its position and is now known as Bledisloe Lodge; it is a hostel for students of the Royal Agricultural College, Cirencester.

* * *

There are on the market electrical devices for scaring birds but bats present a somewhat different problem. I understand, however, that the vicar of Bozeat in Northamptonshire has satisfactorily employed his own methods of getting rid of the pests from his vicarage, utilizing a porcelain cat with illuminated eyes. Perhaps of wider application would be a porcelain dog with illuminated eyes to frighten away cats.

* * *

A Dutch auction now has a meaning somewhat different from the usual one in the flower market at Alsmeer. Moving with the times, the auctioneers have had an all-electric indicator installed there. This indicator is set in operation by the auctioneer. When it reaches the price a purchaser is prepared to pay, the latter presses a button on his desk and the number corresponding with his seat appears in the centre of the dial. The procedure is extremely rapid and saves a great deal of time.

* * *

Those of my readers who are interested in photography will find useful an informative article on " The Theoretical Basis of Exposure Tables for Daylight Black and White Photography " that has been reprinted from the *Journal of Photograph Science* (the scientific publication of the Royal Photographic Society). The author is Mr. L. H. A. Carr, whose name will be better known to readers for his many contributions to the technical literature of the electrical engineering industry and who is consulting engineer and organizer of post-graduate studies of the Metropolitan-Vickers Electrical Co. The first part of the article deals with the photographing of an unshaded close-up scene and in the second part the investigation is continued for other types of scene after which a complete exposure table is evaluated.

* * *

I learn from a correspondent that a metal fence on a football pitch at Christchurch Meadows, Derbyshire, is to be " earthed " before the next game. Spectators who leaned against it during a recent match (played in a thunderstorm) complained that they received electric shocks. No safeguards can, of course, be provided against shocks which may be served up by visiting teams.

* * *

A Warwick resident recently complained to her Member of Parliament that she and other people were troubled by the " blaze " from the modern street lamps outside their bedrooms which kept them from their sleep. The Member replied that before the lamps were installed there had been complaints of darkness of the streets and it was not possible to make any alteration. The M.P. for Warwick happens to be Mr. Anthony Eden. It must be a relief for the Foreign Secretary to cast aside for a moment the burden of international affairs to pacify a dazzled lady.

* * *

To anyone who has seen the film " Life with the Lyons " a situation recounted in the *Daily Express* will be vaguely familiar. When a tenant of a new flat at Portsmouth put on his hall light switch the bedroom light went on. He switched on the kitchen light and the lounge light went on too. Then he tried the bedroom switch: it lighted the bathroom. He had to take out the bulb in the kitchen before going to bed. No switch in the flat would turn it out. The report adds " the electricians were puzzled and said they would come back later."

* * *

Plans for water power developments in Britain were described by A. A. Campbell Swinton in a British Association paper reported in the *Electrical Review* of 2nd September, 1904. An installation at Cragside, Northumberland, in 1882 was believed to be the earliest practical example in the world of the production of electricity by means of water power and its transmission to a distance. It consisted of a Siemens continuous-current dynamo belt driven by an 8 h.p. water turbine with a fall of 30ft, electricity being delivered at 90 V by bare overhead wires to a house a mile distant. At first an earth return was tried, but " owing to the low voltage employed and the exceedingly rocky nature of the ground no useful amount of electricity could be transmitted " and a second conductor was added. The only large-scale hydro-electric plant in this country fifty years ago, however, was that of the British Aluminium Co. on the shores of Loch Ness. The same company proposed to carry out a scheme at Loch Leven and a Scottish syndicate had plans for a project at Loch Sloy, the scene many years later of one of the North of Scotland Hydro-Electric Board's biggest developments. At about the same time (1904) the North Wales Electric Power Co. obtained parliamentary powers to harness the waters of Lake Llydow in Snowdonia.

INDUSTRIAL NEWS

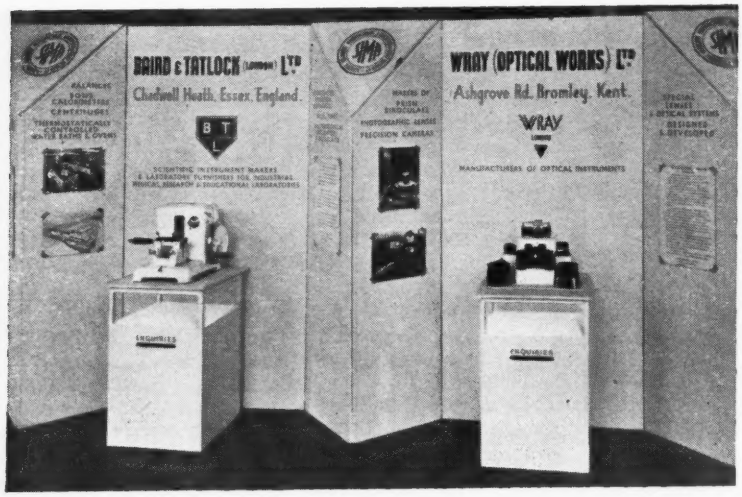
Equipment for Steelworks

The General Electric Co., Ltd., has recently received from Richard Thomas & Baldwins, Ltd., a contract valued at £238,000 for electrical plant and equipment for the Ebbw Vale Steelworks, where an existing 3-stand tandem cold mill is to be converted into a 4-stand mill. The order covers two 3,000 h.p. and one 750 h.p. twin-armature d.c. motors, a 6-machine motor-generator set driven by a 9,000 h.p., 11 kV synchronous motor, and all the associated a.c. and d.c. switchgear together with control gear embodying control exciters. The electrical plant and equipment for the original mill, which has been in service since 1938, was also supplied by the General Electric Co., Ltd.

Instrument Makers' Travelling Exhibition

To overcome the problems of high costs of participating in overseas trade fairs, SIMA (the Scientific Instrument Manufacturers' Association of Great Britain) has developed for its members a simple, entirely self-contained, and easily transportable display stand. The display unit consists basically of a central panel with a pedestal in front of it, on which a single instrument may be shown, and two side panels on which photographs of other products may be mounted. The pedestal has a space for sales and technical literature, and a slot through which inquiries may be dropped. The stand can be easily collapsed and folded flat for transport, and may be erected anywhere without skilled labour. One unit can stand alone or any number may be built up into a variety of patterns and shapes. The Association intends to send the exhibition to various European countries. It is going first to Rome for the exhibition held in conjunction with the tenth general assembly of the International Union of Geodesy and Geophysics from 13th to 25th September. Sixteen member firms are taking part. Each unit is constructed of plywood braced with battens, and measures 6ft 11in by 3ft 7in by 5½in when collapsed and packed.

The display stand of the Scientific Instrument Manufacturers' Association which is to tour overseas trade fairs



Faraday House

Faraday House Engineering College, Ltd., has been formed as a private company with a capital of £10,000 in £1 shares. Its objects are to establish and maintain a college or colleges for scientific education, particularly instruction in electricity and engineering, etc. The income and property of the College, whencesoever derived, shall be applied solely towards the promotion of its objects. The management is vested in a Council the first members of which are to be appointed by the subscribers. The solicitor is L. W. Snow, Old Chapel House, East Bergholt, Colchester, and the registered office is at Faraday House, 66, Southampton Row, London, W.C.1.

Fire Connected with Bare Wires

At an inquest at Nottingham on a thirteen-year-old boy who was found lying across an electric fire it was stated that there was no plug on the lead and three bare wires had to be inserted into the socket.

The boy's father said that he had taken the plug off the fire and put it on to an electric iron. When he wanted to use the fire, he put the wires into a wall socket and had shown his son how to do this. An East Midlands Electricity Board representative said that he found the upper element of the fire broken, which made the whole appliance "live." The fuses in the house had been fitted with a wire which was far too heavy for the circuit and one of the fuses carried three times the capacity it should have done. Returning a verdict of "Accidental death" the coroner obtained a promise from the boy's father that he would not again tamper with electrical matters. He also expressed the hope that the inquiry would serve as a warning to others.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £240 10s 0d
Fire Refined 99·70%	ton £239 0s 0d
Fire Refined 99·50%	ton £238 0s 0d
COPPER Tubes ..	lb 2s 3¾d
Sheet	ton £300 15s 0d
H.C. wire and strip ..	ton £269 0s 0d
LEAD, English ..	ton £99 5s 0d
Foreign	ton £98 0s 0d
MERCURY	flask £100 0s 0d
TIN, block (English) ..	ton £730 0s 0d
ZINC, G.O.B. Foreign	ton £77 3s 0d
Electrolytic	ton £85 14s 0d
BRASS Tubes (solid drawn)	lb 1s 10⅞d
Sheet	ton £245 15s 0d
Wire	lb 2s 6½d
PHOSPHOR BRONZE Wire	lb 3s 8½d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 20½d–20⅝d

Diesel Sets for U.S. Army

R. A. Lister & Co., Ltd., have signed a contract with the Signal Division of the United States Army in Europe for diesel engine electric generating sets and spare parts to the value of approximately £285,000. This is the second contract of this kind obtained by the company for electrical equipment for American Forces in Europe.

Contract Price Formulæ

The British Electrical & Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 14th August is deemed to be 150s 6d. The "cost of material" figures are:—

For electrical machinery and equipment the Board of Trade index figure published on 14th August is 150·8.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 150·8 (provisional), blast furnaces and iron and steel smelting and rolling (40 and 41), 145·9 (provisional), price of ⅞in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*,

The mobile exhibition of fans of Woods of Colchester, Ltd.

13th August), 3s 6½d per lb. Outstanding contracts covered by the B.O.T. intermediate products index: the index figure for intermediate products (14th August) is 360·3 (provisional).

Kenwood German Contract

Mr. K. Wood, managing director of Kenwood Electrics, Ltd., has signed a contract with a German firm of electrical engineers in Stuttgart. This deal will last for ten years and it will ensure that Kenwood electric food mixers will in future be extensively marketed in Germany and also throughout Austria, Turkey and Israel. The contract also allows for a complete interchange of information and ideas on the manufacture of food mixers.

Irish Hire-Purchase Agreement

Mr. M. J. O'Connor, secretary of the Society of Irish Electrical Traders, has announced that the conclusion of an agreement between the Electricity Supply Board and the Society now extends the Board's hire-purchase scheme to contractor members of the Society. The agreement, which followed months of negotiations, came into operation three months ago. It enables contractor members of the Society to sell appliances to consumers on a hire-purchase basis, leaving the collection of the purchase price to the E.S.B., which pays the contractor on each appliance sold. Under this system the consumer pays the E.S.B., which adds the instalment on to his bi-monthly bill. To the cash price is added 4 per cent hire-purchase price. The only limitations to the scheme are those which stipulate the competence of the contractor to service articles sold. These include cookers, kettles, irons, etc., which, until now, the E.S.B. has sold direct to the consumer.

Mobile Exhibition of Fans

The value of taking engineering products to the customer and letting him examine them at first hand has been amply proved by Woods of Colchester, Ltd., manufacturers of fans. Four years ago the company began to operate a small mobile exhibition which proved successful not only in Great Britain but also in Canada, where it travelled 14,000 miles. Because of its proved usefulness, the company has replaced the original unit with a larger mobile exhibition in which are displayed typical examples of industrial, marine and mine fans, all power operated, together with component parts including motor frames, impeller hubs and wings.

World Poultry Congress

In our last issue we briefly referred to the display of the South East Scotland Electricity Board at the World Poultry Congress. On its stand there was displayed a range of equipment which included a new incubator, infra-red brooders, a small egg grader, a new hammer milling unit, root mincer, mixer, wet plucker, deep freeze, and cooker, and the latest piece of equipment just placed on the market, a wing and tail feather plucking machine by Cope & Cope, Ltd. A special feature of the exhibition was the series of daily demonstrations on the preparation of eggs and poultry for the table. Miss Elizabeth Craig gave electric cookery demonstrations, with the assistance of Mrs. Jean Bambrick and Miss Elspeth Paterson, Board demonstrators.

The display of the South East Scotland Electricity Board at the World Poultry Congress

Post Office Engineering Wages

The Post Office Engineering Union, which has 58,000 members employed mainly on work connected with the installation and maintenance of the telephone system, is planning a series of mass meetings of its members, beginning with a meeting in London on 30th August, to report on the wage negotiations in which it has been engaged for the last eight months.

Pre-Packaging of Equipment

One of the first "dry rooms" in Great Britain to conform to the new Ministry of Supply regulations governing the pre-packaging of radar and electronic equipment for the Services has been built by Geo. Salter & Co., Ltd., at their No. 2 factory in Spring Road, Smethwick. The Ministry has ruled that in addition to being pre-packed by methods which ensure that the equipment is impervious to outside climatic conditions, each item of equipment must be thoroughly moisture-free before packing begins. The new Salter "dry room" uses a bank of electronic equipment to keep humidity at a fixed low level and to control temperature. The chamber was planned and designed by Mr. A. Dudley, the company's works engineer and his assistant, Mr. D. Parkes.

Montreal Electrical Show

The Eastern Canada All-Electrical Show will be held in the Show-Mart Building, Berri Square, Montreal, from 6th to 10th October next.

The display will include cables, wire, wiring devices, fittings, conduits, panels, insulation, transformers, power equipment, motors, instruments, power tools, lamps, fixtures, appliances, refrigerators, stoves, washing machines, heaters, sewing machines, vacuum cleaners, electronic component parts, communication systems, recorders, and radio and television equipment. United Kingdom manufacturers of electrical products included in the above list and represented in Canada might like to encourage their agents to take part. Applications for space should be made to the Eastern Canada Exhibitions Inc., 423, Ontario E., Montreal. Leaflets are available from

the Exhibitions & Fairs Branch of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1 (telephone: Chancery 4411, Ex. 436).

India Supply Mission

The Federation of British Industries draws the attention of its members to the fact that it regularly receives tender notices issued by the Government of India Supply Mission in Washington, D.C. These are always available for inspection at the Commonwealth and East Asia Department. Owing to the amount of detail in most of them, it is not possible to duplicate them for circulation but the Federation is prepared to give full details to anyone interested. The Commonwealth and East Asia Department keeps a record of concerns interested in such tender notices and members are advised when their particular products are specified in the tenders.

British-Swedish Chamber of Commerce

British businessmen have joined with Swedish importers to set up a British-Swedish Chamber of Commerce with headquarters in Stockholm. This will be opened there by the Minister of Works on 7th September. It is hoped that the establishment of the new Chamber will do much to stimulate our trade with Sweden. The headquarters is furnished with gifts from Swedish and British sources. As Sweden is a country of high design standards, the Council of Industrial Design was invited by the Federation of British Industries to plan the furnishing and colour schemes for the two rooms which are the British contribution. The furnishings include three 4ft fluorescent strip fittings, a pendant light and two wall bracket lights in the reception room and four fluorescent circle lighting fittings, presented by the General Electric Co., Ltd.

More Trunk Calls

During the year ended 31st March last the Post Office handled a total of 277·9 million inland trunk calls. The total value of these calls was £39·3 million and the average value of each call was 33·97d. These figures represent increases over the previous twelve months of 5·2 per cent in the number of calls, 6 per cent in the total value, and 0·7 per cent in the average call value. July was the busiest month with nearly 25 million calls.

Educational

The Manchester and District Advisory Council for Further Education has published a booklet containing particulars of post-advanced lectures in electrical and mechanical engineering at technical colleges within its area for the session 1954–55. Copies may be obtained from the Council's Offices, Deansgate, Manchester.

The prospectus of evening courses in electrical engineering, including telecommunications, for the session 1954–55 is now available from the Electrical Engineering Department of the Polytechnic, 309, Regent Street, London, W.1.

European Trade Fair

The European Trade Fair will be held at Strasbourg from 4th to 19th September. British electrical concerns who are exhibiting are the General Electric Co., Ltd., and the Arvin Electric, Ltd. Mr. R. C. Lieberman, 178, Fleet Street, London, E.C.4, has been appointed sole representative in this country for the Fair.

Employment of Older Persons

The Royal Institute of Public Administration and the University of Birmingham are holding a one-day conference on the employment of persons in the older age groups at the University, Edgbaston, on 28th September. The conference will be opened by the president of the West Midland Group, Mr. A. E. Fordham, and an address on the medical view of the problem will be given by Lord Amulree.

N.I. Radio Works Expansion

Corran Works, Ltd., the Larne (Co. Antrim) subsidiary of Pye, Ltd., is to be doubled in size. The factory was established just over six years ago. A hundred more men and 400 more women will be needed and eventually the company hopes to employ over 1,000 workers at Larne. At the moment the N.I. Ministry of Commerce is constructing an extension to the factory and this extension will be incorporated in the more ambitious plans for the company.

North Wales Building Exhibition

Local branches of the National Federation of Building Trades Employers and the National Federation of Building Trades Operatives, the allied professions and the Ministry of Works are co-operating with Denbighshire Technical College in an exhibition to be held at Wrexham from 27th September to 2nd October. The exhibition, the first to be held in North Wales, will be opened by Lord Lloyd, M.B.E., Parliamentary Under-Secretary of State for Welsh Affairs.

Advertisement Correction

In the advertisement in our last issue for appointments in the South Wales Division of the British Electricity Authority, the salary for a senior draughtsman (mechanical and electrical), salary schedule D, grade 5, should have read £567–£671 per annum, and that for an engineering draughtsman (mechanical and electrical), salary schedule D, grade 6, £433–£567 per annum.

Change of Name

The Renold & Coventry Chain Co., Ltd., has changed its name to Renold Chains, Ltd., and has moved to new offices at Renold House, Wythenshawe, Manchester.

Trade Announcements

Mr. T. Lynch, 104, Carter Drive, Havering Park, Romford, Essex, has been appointed by **Cuxson, Gerrard & Co., Ltd.,** as their representative for the counties of Norfolk, Suffolk, Essex, Middlesex, Hertfordshire, Huntingdonshire, Cambridgeshire, Bedfordshire and Buckinghamshire.

The **L.P.S. Electrical Co., Ltd.,** has appointed Mr. J. P. Abbott as outdoor representative covering the London area. Mr. Abbott was previously with the Telegraph Construction & Maintenance Co., Ltd. Mr. D. Prior ,of 27, Livingstone Road, Pokesdown, Bournemouth, has been appointed outdoor representative covering the Southern Counties.

Winston Electronics, Ltd., Hampton Hill, Middlesex, inform us that as "Voltastat" is similar to a trade name used by another electrical manufacturer they have discontinued its use. Instead, "Constavolt" will be used when the stabilized voltage control equipment is designed for battery charging, etc., and "Magnetrol" when used for rectification, battery elimination and similar purposes.

The London office of **Davey, Paxman & Co., Ltd.,** is now at 1, Balfour Place, Mount Street, London, W.1 (telephone: Grosvenor 6114).

The address of **Checklox** is now 14, Harley Street, London, W.1 (telephone: Museum 7932).

Catalogues and Lists

Arthur Tipper, Ltd., Victoria Foundry, Willenhall, Staffs.—Illustrated priced catalogue of conduit fittings.

Thermix Industries, Ltd., 29, Grosvenor Place, London, S.W.1.—Technical brochure describing the "Tubix" high efficiency multi-cyclone dust collector.

Brooks & Walker, Ltd., 47, Great Eastern Street, London, E.C.2.—Leaflet describing the new multi-purpose "Diprofil" machine for filing, grinding, honing, engraving, sawing, etc.

The Lewis Spring Co., Ltd., Resilient Works, Redditch.—40-page catalogue covering the company's range of springs, pressings and wire forms, together with a useful table of reference.

B.E.N. Patents, Ltd., High Wycombe, Bucks.—Leaflet describing the new internal atomizing spray gun (C.B. 109).

Ransomes & Rapier, Ltd., Waterside Works, Ipswich.—Eight catalogues dealing with a range of the company's products including mobile cranes, water control gear, excavators.

A. Reyrolle & Co., Ltd., Hebburn, Co. Durham.—Leaflet describing a range of control switches developed for use with switchgear for circuit breakers, etc. (1138/6–54).

The Telegraph Condenser Co., Ltd., North Acton, London, W.3.—Illustrated sectionalized catalogue covering the company's range of condensers, including paper, electrolytic, mica, ceramic, plastic film and special purposes types (R.L. 400/S).

J. & H. Smith, Ltd., Harrison Street, Leeds, 1.—Illustrated leaflet featuring "Emco-Unimat" universal miniature machine tool for turning, drilling, grinding, polishing, etc.

Transformers (Watford), Ltd., Sandown Road, Watford.—Leaflet introducing the manufacture of dry-type air-cooled distribution transformers with all silicone impregnated insulation.

TENNESSEE PAPER MILLS

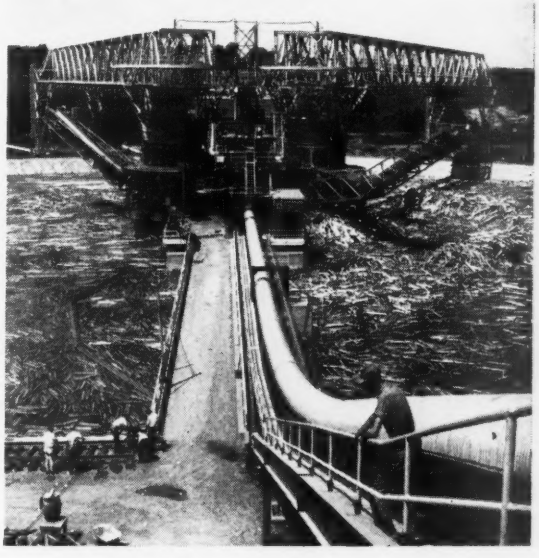
New Bowater Plant in United States

EARLY in October the new pulp and paper mills of Bowaters Southern Paper Corporation are to be officially opened at Calhoun in Tennessee. The mills are, however, already in operation and deliveries of newsprint have been made to publishers, mostly in the Southern States. This project represents the largest investment of British capital in the United States since the war. The mills were erected at a total cost of $60 million and are operated by Bowaters Southern Paper Corporation, a wholly owned subsidiary of the Bowater Paper Corporation, Ltd., of London.

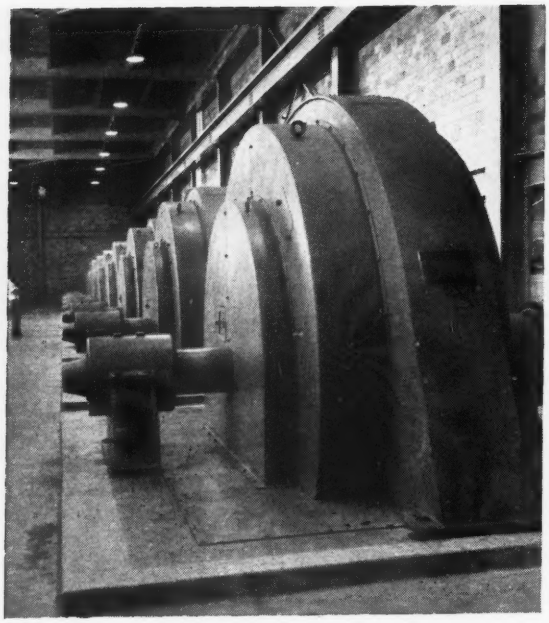
The initial design capacity of the mills is 130,000 tons of newsprint and 55,000 tons of kraft pulp annually, making them the largest of the three newsprint mills in the Southern States. The entire production of the mills has been sold for the next fifteen years.

A total of 906 cords of pine per day is used, shipped by river barge, railway, and trucks. Wood is unloaded and either placed directly on a multi-chain feeder or into the pulpwood pit. All wood in the pit is handled on to one of the two multi-chain feeders which drop the logs on to a revolving, elevated turntable used for final sorting of species and for feeding wood selectively to all or any of the three barking drums. This turntable, a flat ring in shape, is 60ft in diameter and 7ft wide, and runs continuously. The dry method of barking is used, bark being removed by belt conveyors.

Wood is fed from the barking drums to two parallel cable conveyors which run from the drums through the wood room to the centre of a duplex storage pond capable of accommodating 30,000 cords under water. Here it is dumped on to a 40ft diameter turntable, thence passing to



On arrival at the mills the pulpwood is de-barked and stored under water to prevent deterioration. This pond holds 30,000 cords which will meet the mills' requirements for six weeks



Pulp is produced mechanically, by grinding the logs or chemically, by cooking small chips of wood under pressure in digesters. These eight 4,500 h.p. synchronous motors drive the grinders

a revolving stacking conveyor which places it in a semi-circular pile having a central radius half that of the pond. Recovery of wood from the pond is by duplicate pivoted gantry cranes which place it on chutes at the centre of the pond turntables, from which it is scraped off on to the appropriate cable conveyor. Apart from conveying wood from drums to pond and from pond to wood room, these conveyors serve as washing flumes.

Wood arrives in the wood room on the two cable conveyors which both unload on to a 40ft diameter turntable, but at different points on the circumference so that wood for mechanical pulp can be scraped off into a butting saw, and wood for chemical pulp can be scraped off into the chipper chute. The former operation is the first in the sequence, so that logs unfit for mechanical pulp can be passed on to the chipper feed point, or sent back to the barking drums. Logs for mechanical pulp, having passed through the butting saw, fall into a chute feeding a 1,900ft long flume, which carries them to the grinder room.

Wood for chemical pulp, having passed through the chipper, is fed by belt conveyor to a surge bin with star feeders and thence to a pair of chip screens. All refuse is conveyed to the power plant, where it is burned. Accepted chips are carried to the chip silos, from whence they are taken by rotary plate feeders which discharge on to belt conveyors carrying them to the digesters.

For the daily production of 312 tons of raw kraft, there are five digesters of 3,300 cu ft capacity. They discharge through electrically operated blow valves through individual lines to a blow tank having a capacity for three blows. The blow steam, after passing through a cyclone in the head of the blow tank, goes to an accumulator and blow steam recovery system for the heating of the water. Relief steam from the digesters is carried to individual separators, thence to a relief cyclone, condenser, and decanter for the recovery of turpentine.

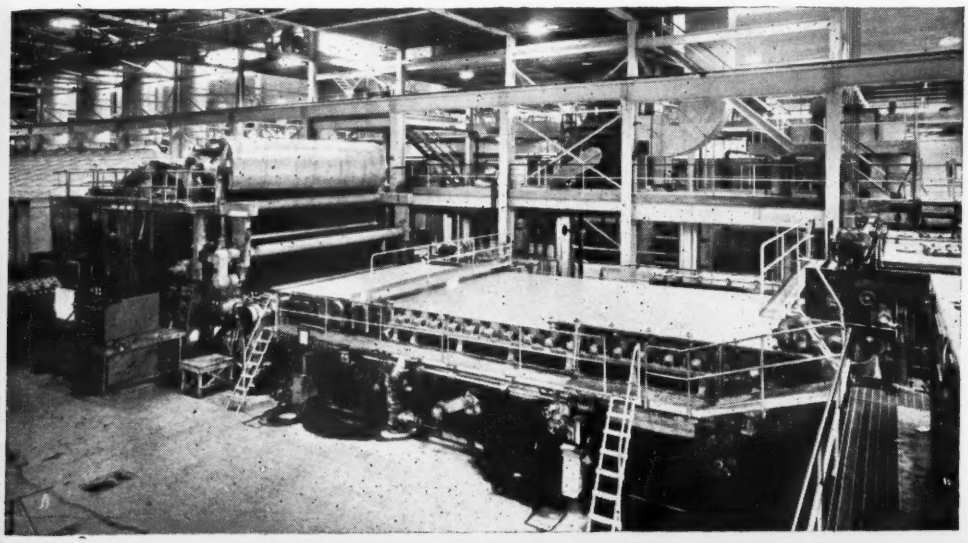
The stock from the blow tank is pumped through a specially designed trap to the pre-knotters and three 8 by 16ft vacuum type washers. These are on the same level as the digester charging floor and are provided with hoods and exhaust fans. The washed stock is pumped from the surge tank at ground level after the high density storage, to a consistency regulator and a primary constant level mix tank feeding two primary centrifugal screens, the accepted stock from which discharges by gravity to two 9ft 6in by 10ft valveless type thickeners, and thence into a screened stock chest. From here as much pulp as it is desired to bleach is pumped at regulated consistency through brushing jordans to a tonnage control unit serving the chlorinators of a three-stage bleach plant.

For drying the unbleached or bleached pulp for sale, a combination high density feltless wet machine and a hot air dryer is used. The wet machine and the conveyors of the pulp dryer are driven by d.c. motors, with the several sections synchronized and receiving their power from a single motor-generator set. Equipment for cutting, laying, and conveying the pulp consists of a heavy duty cutter arranged to furnish from a 156in nominal trim five pulp sheets, 31·25in by 25·5in, and three 47in by 53in wrappers, the cutter being driven by a d.c. motor in conjunction with the dryer.

Returning to groundwood, the logs are delivered from a water flume conveyor to inclined chain conveyors, discharging on to a flat steel apron charging conveyor to the grinders. For preparation of groundwood there are eight grinders, complete with governors and hydraulic control equipment. Each is driven by a 4,500 h.p. synchronous motor, equipped with water coolers.

In the stock preparation room there are two lines of equipment for supplying refined bleached kraft furnish to the paper machines, one line supplying each machine. There are two 252in newsprint machines, designed for speeds up to 2,000 ft/min. Stock and colour are metered to a 12,000 gal/min fan pump supplying the screens. Screened stock is then collected in a de-aerating flume and further diluted before being pumped by a 17,000 gal/min fan pump to the pressurized type head box, with slice of latest design. The Fourdrinier has a 252in wide by 116ft long wire and is complete with table rolls, suction boxes, and savealls for separating the wire drainage from the wire shower water.

The press section consists of automatic suction pickup



There are two Fourdrinier newsprint machines each having a wire width of 252in

roll, a suction transfer press, wringer roll, and two straight through suction presses. The dryer section consists of fifty-five 60in diameter paper dryers and eleven 60in diameter felt dryers, divided into four sections. The calender stack is of the open type, complete with eight rolls. The winders are of high speed design, complete with shaft puller and roll lowering table. The newsprint machines are driven by electric sectional drives and are complete with dryer drainage equipment and a Grewin system. Newsprint rolls are discharged from the winder on to floor type transfer conveyors, where they are rolled into an automatic roll wrapping machine.

To supply the steam requirements of the mill and 20 MW of its electrical requirements, a topping cycle has been chosen for the power plant. Basically the plant operates on a regenerative two-heater cycle, with make-up varying between 20 and 50 per cent. A careful economic study of the proper primary steam pressure and temperature resulted in the selection of 875 lb/sq in and 825 deg F, which is produced in one recovery boiler, one bark burning boiler, and two power boilers. One of the factors in the determination of this pressure was the construction of the mill in the low-cost T.V.A. power region.

The recovery boiler has a 24 hr dry solids capacity of 950,000 lb or an average steam production of 123,200 lb/hr. A twin electrostatic precipitator is installed at the discharge end of the i.d. fan. The bark burning boiler is capable of producing 125,000 lb/hr of steam, with either bark or natural gas firing. Under normal anticipated conditions there is enough bark to maintain about a 68,000 lb/hr steam load. Only when one of the power boilers or the recovery boiler is out of service is it necessary to fire natural gas in the bark boiler for additional steam. This boiler is equipped with a travelling grate and spreader stoker for the bark, and tangential burners for the natural gas. The boiler section is of the straight through no-baffle type. In front of the bark boiler above the firing aisle is a bark storage bin of 6,000 cu ft capacity. Bark is fed from this bin into the spreaders by screw conveyors placed across the bottom.

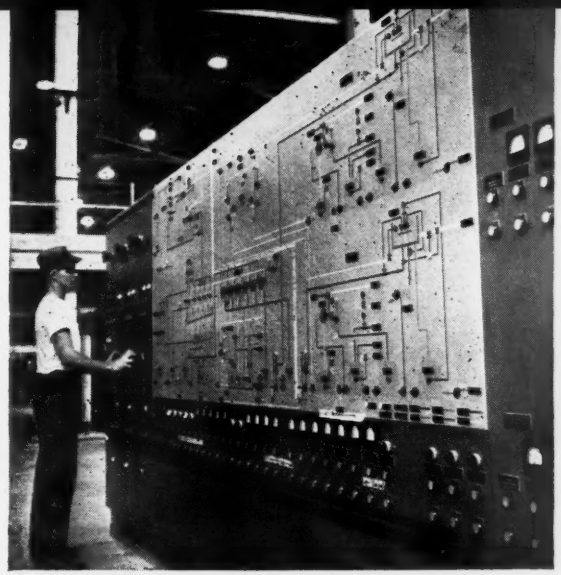
Each of the power boilers is of 150,000 lb/hr capacity, fired primarily by natural gas, with provision for oil firing during periods of natural gas shortage. Under normal circumstances these boilers share whatever load is required in excess to the bark and recovery production. In laying out the auxiliary equipment for these units provision has been made for the possible future addition of coal bunkers and pulverizers. The furnaces are provided with hopper bottoms to permit the use of pulverized coal without changes to the unit proper.

To obtain topping power from the process and heating steam, two turbo-generators of 10 MW capacity each were chosen. One turbine has throttle conditions of 850 lb/sq in and 825 deg F, automatic extraction at 50 lb/sq in and a condenser for 2·5in Hg. The other turbine has the same throttle conditions, with automatic extraction at 150 lb/sq in and 50 lb/sq in back pressure.

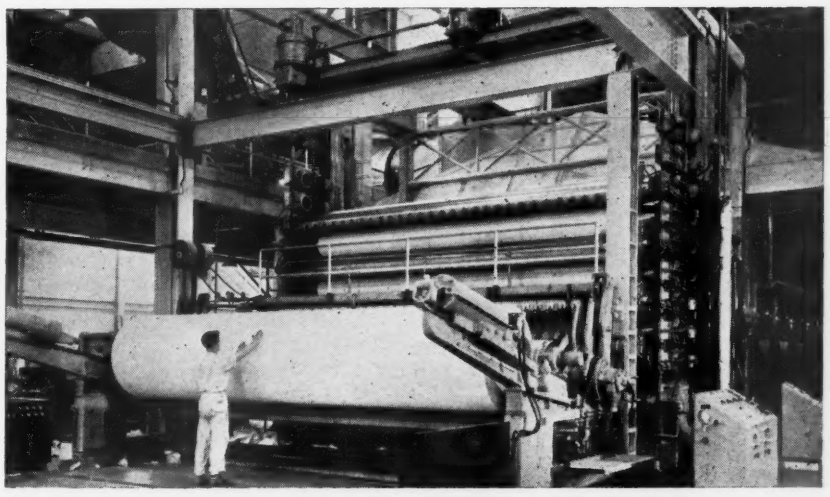
Two steam pressure levels are needed for the mill facilities. They are 150 and 50 lb/sq in. Extraction and exhaust steam taken from the turbines is fed to 150 and 50 lb/sq in headers, respectively. From these steam is taken for the mill and for whatever station service is required. Desuperheaters are located in the mill take-offs to reduce the temperature to just above saturation. Linking the 850, 150, and 50 lb/sq in headers are lines to ensure flexibility under any foreseeable conditions. Within the power house there is a 5 lb/sq in header, with a bypass connection from the 50 lb/sq in header. Steam for No. 1 feedwater heater is taken from the former header.

Make-up water is added to the condensate storage tank along with the mill returns and condenser hot well returns. The make-up varies between 20 and 50 per cent of the total feedwater flow, depending on the operating conditions. A condensate pump (with a stand-by pump) takes water from the condensate tank and pumps it to the de-aerating heater, which operates at 5 lb/sq in.

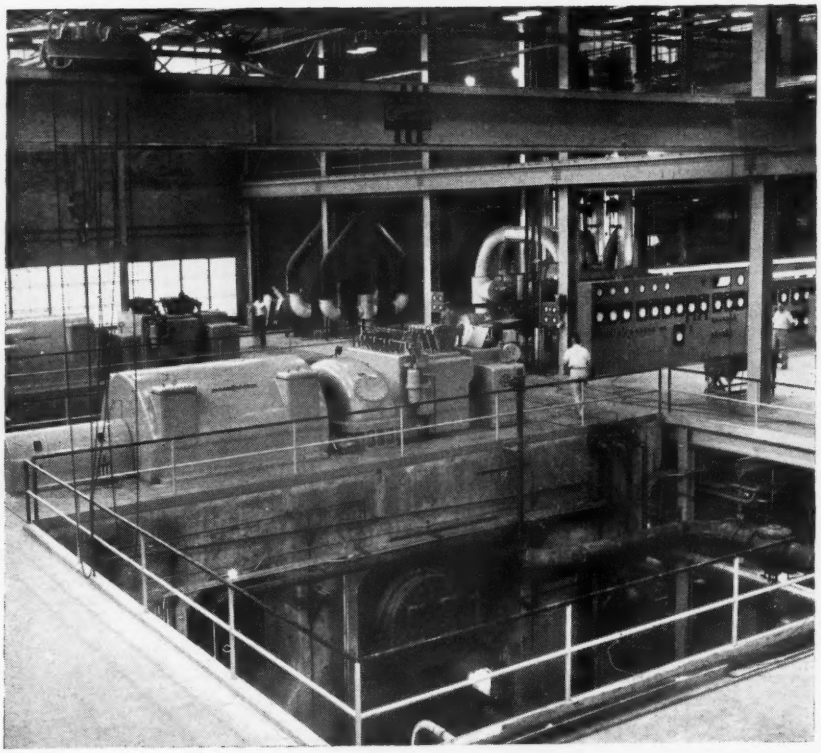
Water at about 228 deg F leaves the de-aerating heater and falls to the boiler feed pumps. The feedwater pump raises the pressure to 1,080 lb/sq in which is enough to carry it through No. 2 heater, through the feedwater control valves and into the boilers. No. 2 heater receives steam from the 50 lb/sq in header to heat the feedwater to 280 deg F. The condensate from this closed heater is



One of the main control panels in the groundwood mill. It incorporates a flow diagram indicating the position in the production sequence of every piece of equipment in this section of the plant



Each newsprint machine is designed for speeds up to 2,000 ft/min. This is a view of the dry end of one of them



The mills need nearly 40 MW of electric power, half of which is generated in their own plant. This is a view of the power house showing the two turbo-generators, each of 10 MW capacity

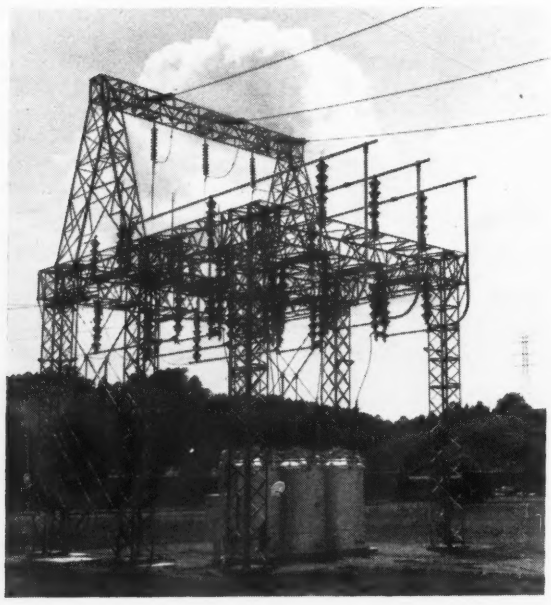
discharged directly into the open heater.

The feed pump station consists of three identical pumps, each rated at 1,200 gal/min and 2,500ft head. The principal pump is driven by a steam turbine and an electric motor. The other pumps are motor driven only and intended for stand-by service. The turbine drive for the feed pump receives steam from the 150 lb/sq in header and discharges it to the 5 lb/sq in header, which in turn supplies steam to the open heater. A back pressure regulator controls the flow of steam to the turbine, which varies the amount of pump load that the turbine can handle.

To keep the pump up to speed, the motor connected to the other extended shaft of the pump takes up the remainder of the load. Normally, this drive is lightly loaded or just floating on the shaft, but whenever the flow of steam to the de-aerator falls below that required for full pump power, the motor picks up load. The feedwater flow includes that which is necessary for steam production, plus about one per cent for continuous blowdown. The blowdown is flashed at 50 lb/sq in, the flash steam being piped into the 50 lb/sq in header.

To supply mill and station compressed air, two compressors are installed. One of these is in the turbine room and the other in the mill. They operate at 110 lb/sq in and supply all of the plant's service air requirements. A recovery air compressor is also in the turbine room for use by the recovery boiler air soot blowers. It discharges at 350 lb/sq in.

About half of the electric power for the mills is drawn from the Tennessee Valley Authority. This picture shows a T.V.A. substation on the mill site for incoming power



For full-scale production of the mill about 37 MW of electric power is required, which includes 20 MW for the wood grinding operations. This is obtained from the two turbo-generators operating at their rated output, the rest being obtained from the T.V.A. network. Normally the turbines operate in parallel with the T.V.A. network, but the electrical system is arranged for independent operation, with the power from the T.V.A. system being used in the groundwood area and the turbo-generator output in the rest of the mill. In addition, capacity has been provided in the T.V.A. facilities to permit full-scale operation of the mill with one of the generators out of service.

Electric power at 13·8 kV three-phase 60 c/s is distributed throughout the mill to the various load centres for conversion to utilization voltages. The power supplied by the T.V.A. is delivered to the grinder room substation where, through two 15 MVA three-phase transformers, 4,160 V is made available for eight 4,500 h.p. unity power factor synchronous motors driving the grinders; and through two 750 kVA unit substations, 460 V is made available for auxiliary equipment motors. The power from the two 10 MW turbo-generators is distributed at 13·8 kV to the wood yard, pulp mill, bleaching, stock preparation and machine room areas, where it is transformed to 460 V for motors up to 200 h.p. and 2,300 V for motors of 201 to 1,000 h.p. capacity. The two turbo-generators and the T.V.A. system are interconnected through a synchronizing bus, with complete system control situated in the power plant.

The primary control equipment is arranged for simplicity and convenience of operation as well as for safety of

personnel, together with provision for isolation of power sources and sectionalizing of the load for other than normal operating conditions. The arrangement is flexible in that it readily permits inclusion of the necessary controls for additional power sources and load whenever required.

Primary control equipment was selected on the basis of continuous current rating together with the short circuit kVA available at the point of utilization, and the whole co-ordinated to a 500 MVA level. This co-ordination was extended in the selection of unit substations to permit the use of 150 MVA high interrupting capacity motor starters for the 2,300 V motors, and combination magnetic starters in motor control centres for the 440 V motors.

Use of unit substations together with l.v. motor control centres practically eliminates any l.v. power distribution. In the case of 2,300 V equipment, the motor starters form the l.v. section of the substations; hence the motor loads constitute the 2,300 V wiring. For the 440 V wiring, there are only short stub feeders to the motor control centres, and the motor loads make up the balance. Local control of the motors is accomplished with push-button stations placed at the machines and with the individual starters in isolated control rooms along with the unit sub-stations.

Motor applications throughout the plant are in general of the conventional type and required only standard equipment. However, the grinder motors are enclosed with built-in air coolers, and each of the paper machines is provided with an electronically controlled adjustable speed variable voltage sectional drive, including multiple generator motor-generator sets, and 500 V d.c. adjustable speed, enclosed, separately ventilated section motors.

The plant lighting system is sectionalized according to departments and locally controlled. In some areas mercury-vapour filament combination fittings are used and in others filament type units, depending upon the process, atmospheric and structural conditions. Power for the plant lighting is obtained from the 750 kVA unit sub-stations of the general power system and distributed at 460 V to the area centres, where it is transformed to 115/230 V for the lighting units. The plant also incorporates unusually comprehensive welfare facilities.

Legislative Changes Affecting Contracts

By C. F. MAYSON, A.M.I.E.E.

TWO recent Acts of Parliament, the Law Reform (Enforcement of Contracts) Act, 1954, and the Law Reform (Limitation of Actions, etc.) Act, 1954, have made important changes in the law relating to contracts. Although these measures are quite independent of each other, they may conveniently be considered together, because they both have a bearing upon the bringing of actions for breach of contracts of sale and of employment.

Some two years ago the writer dealt in these columns with the essentials to the formation of contracts,* and referred in particular to those cases where it was necessary for contracts to be in writing. It was pointed out that contracts which were not to be performed within a year of their making and those for the sale of goods valued at £10 or over must, if they were to be enforceable at law, be wholly in writing. Those provisions were originally contained in the Statute of Frauds, which was passed in 1677 for the " prevention of many fraudulent practices." That Statute was rendered necessary by the confused conditions which prevailed in Cromwellian and Restoration times, and which encouraged the bringing of many false claims by dishonest litigants. The part of the Statute relating to the sale of goods was re-enacted, two centuries later, by the Sale of Goods Act, 1893, s. 4.

For many years now these provisions have been the subject of almost universal criticism for, although the Courts have done their best to prevent them being used as " instruments of fraud " by unscrupulous persons whose unfortunate opponents could not produce the necessary written evidence, many a hardship was suffered because the requisite written contract (or " note or memorandum " as it was called) was not in existence. Now, at long last, this blot on the face of the law of England (it was never part of Scottish law) has been removed by the passing of the Law Reform (Enforcement of Contracts) Act, 1954, on 4th June last.

Henceforth, the only contracts required to be in writing (apart from those " for the sale or other disposition of land or any interest in land ") are those of guarantee. But, as these are normally used only in connection with hire-purchase agreements (which must themselves be in writing if they fall within the Hire-Purchase Act, 1938), and are contained in the printed forms usually employed for such agreements, the exception is of minor importance to electrical manufacturers, traders and contractors.

It will be remembered† that, in a sale of goods, lack of writing was not a bar to the enforcement of a contract provided the goods had been accepted and actually received by the buyer. That exception has also gone, so that the proving of an oral contract is now simply a matter of evidence, unfettered by any technical rules governing the " acceptance " and " receipt " of goods.

The other change in the law concerns the time within which an action for breach of contract may be brought. The general law on this matter is contained in the Limitation Act, 1939, which states that action must be brought within six years of the breach (except in the case of a deed or contract under seal, when the period is twelve years). But actions against public or local authorities and nationalized undertakings had, until this year, to be brought within considerably shorter periods. Thus, by the Public Authorities Protection Act, 1893, action against any public authority was barred after the expiry of one year; the Electricity Act, 1947, s. 12, and the Gas Act, 1948, s. 14, limited actions in contract against Electricity and Gas Boards to within three years of breach.

Since 4th June these special periods of limitation have been abolished by the Law Reform (Limitation of Actions, etc.) Act, 1954, so that, henceforth, all such actions, whether accruing before or after that date, are subject to the general provisions of the 1939 Act, provided that the shorter period has not already expired before the effective date.

* " Contracts and Sales," C. F. Mayson, *Electrical Review*, 8th August, 1952, p. 297.
† " Contracts and Sales," *Electrical Review*, 22nd August, 1952, p. 405.

Financial Section

STOCKS and SHARES

AFTER their brief indisposition about the middle of the month, Stock Exchange markets were in good form again before the end of August. Gilt-edged stocks led a revival, in the course of which the new 3½ per cent British Electricity stock, having begun life at a discount, moved up to its par price of 100½. East African Power new debentures, which had also been below their issue price of 100½, hardened to ¼ discount. In the industrial markets many of the best features occurred in the sections devoted to radio and motor accessories.

Higher Prices

Resumption of the upward trend in industrial shares was reflected in improvements of 1s or more in, amongst others, G.E.C., Babcocks, British Thermostats, Clarke Chapman, Electrical Components and Hoover. Morphy-Richards were again especially well favoured, rising half-a-crown for the second week in succession, while useful gains were recorded in Holophane, Marryat & Scott, Aberdare Cables, Aerialite, Venner and others. Hackbridge Cables went back 9d to 15s, after the declaration of the final dividend — which again brings the total to 20 per cent—and the preliminary profits statement. Desoutter Brothers (Holdings) is raising its interim dividend from 7½ per cent to 10 per cent, which suggests that the dividend for the full twelvemonth will be better than last year's 20 per cent. The price is firm at 21s 3d. Brook Motors will hold a meeting on 24th September to consider proposals for raising the authorised capital to £1 million and also for distributing one new share for every seven old shares held.

Radio Show

This year's Radio Exhibition finds the market for the shares in high fettle. Most quotations have risen to a substantial extent on the evidence of generally active business in the radio and TV sections, stimulated recently by the relaxation of hire-purchase restrictions. In addition to this, public interest may still be vague on the technicalities of electronics, but there is no doubt that the scope existing in the future of that particular field has caught the imagination of investors.

Popular Shares

Pye and E.K. Cole are among the radio companies which have lately been raising fresh capital, by the issue of new shares for cash to their stockholders, for the purpose of financing new development. From the market point of view, the Pye issue is now completed, and the 5s deferred shares (which started this year around 16s) are a very strong market at about 32s 6d, yielding little more than 3 per cent on the basis of this year's increased dividend of 20 per cent. "Ekco" new 5s shares are still available in allotment letter form, and therefore free of transfer stamp. E.M.I.

The Week's Price Changes

Company or Board	Nom. Value	Middle price 30th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
						£ s d		
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	95xd	—	3	3	3 3 2	97	88⅞
Brit. Elec. 1974/77	100	94½xd	—	3	3	3 3 6	96½	87½
Brit. Elec. 1976/79	100	101	−½	3½	3½	3 9 4	101½	93⅞
Brit. Elec. 1974/79	100	109	+½	4½	4½	3 18 0	111½	103⅞
Overseas Electric Supply								
Calcutta Elec.	£1	24/-	+2/6	6†	6†	5 0 0†	24/6	18/7
East African Power	£1	21/6	−1/-	7	7	6 10 3	23/4	19/6
Nigerian Elec.	£1	24/-xd	—	10	10	8 6 8	25/-	23/6
Palestine Elec. "A"	£1	20/6		Nil	Nil	Nil	20/6	16/-
Perak Hydro-Elec.	£1	15/9		Nil	6	7 12 4	16/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	11/6	+3d	25	12½*	5 8 8	12/-	8/1
Aerialite	1/-	12/9	+3d	88½	88½	6 18 6	12/9	10/9
Allen, W. H.	£1	75/9	+1/3	15	20	5 5 6	75/9	50/-
Aron Elec. Ord.	£1	45/-		20	15	6 13 4	50/-	43/-
Assoc. Elec. Ord.	£1	60/9	−6d	20	11½*	3 14 0	61/6	41/6
Automatic Tel. & El.	£1	72/6xd	—	15	15	—	73/-	57/3
Babcock & Wilcox	£1	62/3	+1/-	18	12*	3 17 2	62/3	47/3
Baldwin, H. J.	2/-	4/6		20	20	8 18 0	5/6	3/9
Bakelite	10/-	26/3		12½	12½	4 15 3	27/6	23/6
British Aluminium	£1	33/9	−2/6	12	10	5 18 3	40/-	33/9
B.I. Callender's	£1	47/9	+6d	10	10	4 3 9	47/9	37/9
B.I. Callender's 6% Pref.	£1	26/3		6	6	4 11 5	26/3	24/3
British Thermostat	5/-	25/-	+1/3	35	27½*	—	25/-	12/-
British Vac. Cleaner	5/-	13/6	−9d	25	25	9 5 3	14/6	11/6
Brook Motors	10/-	44/3		20	20*	4 10 6	44/6	33/3
Brush Ord.	5/-	7/-		4	6	4 2 9	7/6	3/6
Bulgin, A. F.	1/-	3/6		30	30	8 11 6	3/7	3/2
Burco	5/-	17/-		35	35	5 3 0*	17/-	12/1
Chloride El. Storage	£1	66/3		20	12½*	3 15 4	68/-	46/6
Clarke Chapman	£1	70/-	+2/6	17½	20	—	70/-	47/6
Cole, E. K.	5/-	35/9	+2/-	25	27½	—	38/9	22/6
Cossor, A. C.	5/-	11/-	+6d	10	10	4 11 0	11/-	7/-
Crabtree	10/-	28/9		17½	17½	6 1 9	29/6	23/9
Crompton Parkinson Ord.	5/-	19/6		11½	20	5 2 7	19/6	14/-
De La Rue	5/-	19/3	−3d	Nil	20	5 4 0	21/-	12/3
Decca	4/-	42/6	−6d	150	35*	—	43/-	32/-
Desoutter	5/-	21/3		18	20	4 13 0	21/6	16/1
Dewhurst	2/-	6/-		19	19	6 6 9	6/3	5/1
Dictograph Tel.	2/-	6/6		20	20*	6 3 0	6/6	5/2
Dubilier Condenser	1/-	5/9	+3d	25	25	4 7 0	6/-	4/1
E.M.I.	10/-	22/-	+3/-	12	8	3 12 9	22/-	11/3
Electrical Components	5/-	15/-	+1/3	20	20	6 13 4	15/-	10/9
Elec. Construction	£1	61/3		15	15	4 17 0	61/3	53/-
Enfield Cable Ord.	£1	23/6	+6d	5	Nil	Nil	25/-	16/6
English Electric	£1	55/3	+3d	15	10*	3 12 6	55/3	38/-
English Electric 3¾% Pref.	£1	16/9		3¾	3¾	4 9 7	16/9	15/3
Ericsson Tel.	5/-	26/6		22†	25†	2 7 2*†	26/6	22/9
Ever Ready	5/-	26/3	+9d	35	40	—	26/3	17/9
Falk Stadelmann	£1	38/6		15	15	7 15 10	41/-	36/6
G.E.C. Ord.	£1	53/-xd	+1/3	11½	12½	4 14 3	53/-	37/6
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/3	26/6
General Cables	5/-	17/3	+3d	30	30	8 14 0	17/3	16/3
Greenwood & Batley	£1	50/-		17½	17½	7 0 0	50/-	40/3
Hackbridge Cable	5/-	15/-	−9d	20	20	6 13 4	15/9	11/3
Hackbridge & Hewittic	5/-	22/6		20	25	5 11 0	23/3	16/10
Hall Tel. Acc.	10/-	12/-		10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/-		12½	12½	5 0 0	5/-	4/-
Henley's	10/-	20/3	+9d	10½	10½	5 3 9	20/3	15/6
Holophane	5/-	16/-	+9d	20	20	6 5 0	16/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

10s shares, after a remarkably strong recent revival to 22s, give 3·6 per cent on the money. Among the other popular issues, the 5s shares of Murphy at 13s return 5·7 per cent, Ultra at 19s, 4·4 per cent, and Cossor at 11s, 4½ per cent (with the dividend for 1953/54 imminent).

in Electrical Investments

Company or Board	Nom. Value	Middle price 30th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	44/9	+1/-	25	45	5 0 6	45/3	26/3
I.C.I.	£1	38/3	+6d	13	15	3 18 6	39/-	26/6
Intl. Combustion	5/-	24/-		15	20	4 3 4	24/-	14/6
Johnson & Phillips	£1	25/6		15	15	5 14 3	52/6	47/6
Lancashire Dynamo	£1	59/-		12½	14	4 15 0	59/6	43/-
Laurence, Scott	5/-	23/9		15	20	4 4 3	25/-	14/-
Lister, R. A.	£1	44/-	+1/-	9	12	5 9 0	44/-	31/9
London Elec. Wire	£1	50/6	+6d	15	10*	3 19 4	50/6	38/-
Lucas, J.	£1	39/6	+3/3	9⅜	10⅜	—	39/6	25/3
Marryat & Scott	2/-	7/9	+9d	22½	25	6 9 0	7/9	5/11
Mather & Platt	£1	46/6		12½	15	—	47/-	32/-
Metal Industries	£1	33/3	−3d	12	9	5 8 3	42/3	29/6
Midland Elec. Mfg.	£1	67/6		15	15	4 9 0	67/6	63/-
Morphy-Richards	4/-	25/-	+2/6	40	40	—	25/-	11/4
Murex	£1	54/6	+1/6	15	15	5 10 0	57/-	50/-
Newman Ind.	2/-	2/4½		10	10	8 8 5	2/6	2/-
Oldham & Son	1/-	3/3		17½	17½	5 7 8	3/4	2/5
Parnall (Yate)	5/-	9/3	+7½d	6	8	4 6 6	9/3	4/3
Parsons, C. A.	£1	60/-		12½*	7½*	2 10 0	60/	38/1
Plessey	10/-	57/6		25	30	—	57/6	37/10
Pye Deferred	5/-	32/6	+3/-	20	20*	3 1 6	32/6	15/7
Revo	10/-	14/-		27½	9*	6 8 6	20/3	14/-
Reyrolle	£1	92/6		12½	13⅜	3 0 0	92/6	66/-
Rheostatic	4/-	15/9		19	20	5 1 7	15/9	11/-
Richardsons Westgarth	5/-	11/9xd		15	15*	6 7 8	12/3	6/6
Scottish Cables	4/-	21/3	+3d	20	27½	5 3 6	21/3	12/11
Siemens Ord.	£1	39/3	−6d	10	10	5 2 0	43/9	33/9
Smith (England), S.	4/-	13/3	+6d	12½	15	—	13/-	7/8
Southern Areas	£1	25/-	−2/6	6	7½	6 0 0	27/6	17/6
Strand Elec.	5/-	9/3	+6d	17½	17½	9 9 3	9/3	8/3
Sturtevant	5/-	42/6		18·1†	18·9*†	2 4 9†	42/6	29/-
Sun Elec.	£1	32/6		15	15	9 4 8	32/6	27/6
Switchgear & Cowans	5/-	12/9		22½	10	3 18 6	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½*	5 13 9	12/4	10/7
T.C.C.	10/-	35/-		20	30*	—	35/-	21/3
T.C. & M.	£1	33/6	−3d	10	8⅓*	5 1 6	34/6	30/3
Telephone Mfg.	5/-	9/6	+3d	10	10	5 5 3	9/6	7/6
Thorn Elec.	5/-	26/6xd	+2/6	12½	20	3 15 6	27/-	13/3
Thornycroft	£1	43/-		15	15	6 19 6	47/6	33/4
Tube Investments	£1	68/9		15*	15	4 7 3	68/9	60/3
Vactric	5/-	17/-	−1/9	Nil	10	2 18 9	18/9	7/6
Veritys	5/-	7/6	+9d	10	12½	8 0 8	8/3	5/-
Walsall Conduits	4/-	51/3		70	70	5 9 4	52/6	44/-
Ward & Goldstone	5/-	38/9		45	50	—	38/9	21/-
Watford	2/-	6/9		25	22½*	—	6/9	4/7
Westinghouse Brake	£1	72/6		14	15	4 2 9	72/6	60/9
West, Allen	5/-	16/6		15	17½	5 6 1	16/6	12/7
Wolf Electric	5/-	14/9		15	17½	5 18 9	14/9	11/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	83½		—	6	7 3 9	89½	80
Ord.	100	52½		—	3¾	7 2 10	55½	52
Anglo-Portuguese	£1	24/3	+3d	8	8	6 12 0	24/3	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	63/9	+2/9	35	50	3 18 6	63/9	39/1
Cable & Wireless:								
Ord.	£1	40/-	+1/-	8	9	4 10 0	40/6	26/2
4% Loan	100	98½		4	4½	4 1 3	98½	95½
Calcutta Trams	£1	24/6xd	+4/-	2½†	6†	4 18 0†	24/6	17/1
Cape Elec. Trams	£1	17/-	−6d	5½	7½	8 16 6	17/6	12/4
Marconi Marine	£1	33/9		10	10	5 18 6	33/9	27/6
Oriental Tel. Ord.	£1	92/6	−2/6	16	16	—	95/-	82/6
Telephone Props.	£1	5½		8	8	—	5½	4½
Telephone Rentals	5/-	10/6		10	10*	—	10/6	9/-

Thorn Loan Stock

Dealings have been taking place in the £500,000 Thorn Electrical Industries 4½ per cent unsecured loan stock, which was offered at par to (and heavily over-subscribed by) holders of the company's various stocks. A premium of 2½ to 3 points quickly developed. Ranking, in point of security, somewhere between a debenture and preference stock, issues in this form have become increasingly popular over the last year or two. Together with an existing 5½ per cent loan stock, the principal amount of the new Thorn issue is covered more than three times by net assets of the group, and the combined annual interest requirements about fourteen times by the latest earnings. It is redeemable finally at par in 1974, and can for the present be bought free of the 2 per cent transfer stamp duty.

The Ordinary Shares

Upon the appearance last week of Thorn Electrical Industries' annual report, the company's 5s ordinary shares were marked up by a further 2s 6d, and so achieved the distinction of having just about doubled in value during the course of the present year. The full figures confirm that although the rate of the ordinary dividend is being raised from 12½ to 20 per cent, it still involves the distribution of something under one-fifth of the year's net surplus. This is of course one factor to account for the modesty of the current return on the shares: at 26s 6d x.d. the yield is about 3¾ per cent. Another factor is the provision of new funds through the issue of the £500,000 loan stock. Up to now, the financing of development to a large extent through the retention of profits has made necessary a severely austere dividend policy.

Vickers Issues

Stockholders of Vickers are invited to subscribe more than £10 million fresh capital. Terms of the offers were well up to the expectations which had contributed to the previous rise of about 6s in the price of the ordinary shares during the month of August. The quotation rose further to 41s 6d after the announcement of the proposals. These include an offer of over 3 million new £1 ordinary shares at 27s 6d to existing ordinary stockholders, in the proportion of one new for every eight shares held; also an issue of £6 million 4 per cent unsecured loan stock 1962/69, at a price of 98½. "Rights" to the new ordinary are worth approximately 1s 6d per share, and the market is in no doubt about the prospect of a material premium on the loan stock when dealings start. The new ordinary shares rank equally with the old, except that they will not participate in the interim dividend declared on account of the current year. In the company's statement announcing the new issues, it is said that this year's profits should be at least up to the 1953 level.

REPORTS and DIVIDENDS

The Sterling Cable Co., Ltd., reports group trading profits for the year ended 31st March last of £114,488, a decrease of £48,025 as compared with 1952–53, and after providing £57,953 for taxation, the net profit is £22,437 (against £41,109). The dividend for the year is maintained at 10 per cent, but it is not proposed to pay a bonus (against 5 per cent).

In his statement Mr. J. S. Clark (chairman) says that export sales suffered most from the tendency for buyers to hold off in anticipation of lower prices following the freeing of copper in August, 1953, and it was only late in the year, when metal prices appeared to be steady, that the rush of orders came and the export market regained some stability. The group also had to cope with a revision of British Standards which, by virtue of reduced physical dimensions, brought about a reduction in selling prices, even of stocks of finished cables manufactured to the old standards. During the year much time was devoted to the development of new types of cable for the communication industry, the benefit of which is now being felt. The order book is once again assuming the healthy proportions of some two years ago, and it is encouraging to note the manner in which overseas engineers are adopting the new types of cable now being manufactured.

E. K. Cole, Ltd.—London and Yorkshire Trust announces that in connection with the offer of 500,000 ordinary shares of 5s each to ordinary stockholders at 21s per share, approximately 95 per cent of the shares provisionally allotted were accepted. The balance available was heavily oversubscribed. Every applicant will receive an allotment.

Hackbridge Cable Holdings, Ltd.—The consolidated trading profits for the year ended 31st March, after deducting depreciation, are £247,401, as compared with £403,354 for the preceding year. Taxation absorbs £135,544 and the net profit is £111,857 (against £157,307). The dividend for the year is maintained at 20 per cent by a final payment of 12½ per cent, and the balance carried forward in the parent company's accounts is £2,899 (against £3,116 brought in).

Brook Motors, Ltd.—It is proposed to make a scrip issue of one for seven to ordinary shareholders. The proposals involve the capitalization of £71,335 10s of capital reserve to be applied in paying up in full 142,671 ordinary shares of 10s each. The authorized capital will be increased from £700,000 to £1,000,000 by the creation of 600,000 ordinary shares of 10s each. The new shares will rank *pari passu* in all respects with the existing ordinary shares and will entitle holders to any final dividend declared in respect of the year ending 30th September next. Treasury consent to the issue has been obtained. An extraordinary meeting to consider the proposals will be held on 24th September.

Telephone Properties, Ltd., in a preliminary statement, reports a net profit for 1953, after providing £43,000 for taxation, of £35,252, as compared with £60,964 for 1952. It is proposed to place £27,582 to contingency reserve and to maintain the ordinary dividend for the year at 8 per cent. The balance carried forward is £81,861 (against £74,967 brought in). The directors state that they have approved the publication to stockholders of full details of the proposed reorganization scheme, together with notices of the meetings in respect thereof on 30th August.

Thorn Electrical Industries, Ltd., announces that the issue of £500,000 4½ per cent unsecured loan stock 1972-74 was subscribed between four to five times, and it has been found necessary to progressively scale down large applications to a minimum of 20 per cent.

Parmiter, Hope & Sugden, Ltd., point out two errors in the figures given in our issue of 13th August. The profit for the year to 31st March last was £86,364 and not £77,003, while taxation paid was £48,722, not £39,361 as stated.

Cable & Wireless (Holdings), Ltd., has announced an interim dividend of 3 per cent (same) on capital increased by a 10 per cent scrip issue.

The West London & Provincial Electric & General Trust, Ltd., has announced an interim dividend of 4 per cent (unchanged).

Lancashire Dynamo Holdings, Ltd., has declared an interim dividend of 4 per cent (unchanged).

Brown Brothers & Co., Ltd., are paying an unchanged interim dividend of 2½ per cent.

Desoutter Bros. (Holdings), Ltd., are paying an interim dividend of 10 per cent (against 7½ per cent).

Newton Brothers (Derby), Ltd.—We regret that in the notice in our last week's issue of this company's accounts, the name of the company was incorrectly given as Newman Brothers (Derby), Ltd.

New Companies

Hiscock, Appleby & Co., Ltd.—Registered 21st August. Capital £10,000. Electrical engineers and contractors, etc. Directors: R. C. Hiscock and Nancy B. Hiscock. Regd. office: 2, Cadogan Place, Sloane Street, S.W.1.

A. S. Lowrey & Son, Ltd.—Registered 14th August. Capital £4,000. Electrical engineers and general electrical installation contractors, lighting specialists, etc. Directors: A. S. Lowrey and A. Lowrey. Solicitors: Smirk Thompson & Craigs, Newcastle-on-Tyne.

Hillside Electric (Finchley), Ltd.—Registered 14th August. Capital £500. Electrical equipment specialists, manufacturers of and dealers in batteries, accumulators, magnetos, dynamos etc. Directors: A. W. Marsh and Ruth M. B. Marsh. Secretary: E. W. Chick. Regd. office: 246 Ballards Lane, North Finchley, N.12.

Siba Electric, Ltd.—Registered 1st July. Capital £100. Distributors, suppliers, manufacturers and repairers of electrical and other equipment or parts, etc. Solicitors: Frere, Cholmeley & Co., 28, Lincolns Inn Fields, W.C.2.

A. J. Godden (Electrical), Ltd.—Registered 1st July. Capital £1,000. Electronic and electrical manufacturers, wholesale merchants, fitters, factors, etc. Directors: A. J. Godden and Mrs. M. A. Godden (secretary). Regd. office: 373, Archway Road, N.6.

Door Control, Ltd.—Registered 20th July. Capital £1,000. Manufacturers of and dealers in electrically operated doors, dynamos, motors, armatures, magnetos, etc. Directors: C. W. S. Williams, E. Narracott and A. L. Johnson. Regd. office: 26, Mutley Plain, Plymouth.

Lumenated Ceilings, Ltd.—Registered in Edinburgh 11th June. Capital £10,000. Electrical, ventilation, mechanical and structural engineers, etc. Regd. office: 150, Helen Street, Glasgow.

Electric Whaling, Ltd.—Registered 16th August Capital £100. To buy, manufacture and sell equipment for killing fish and marine animals by means of electricity, etc. Directors: H. C. Margrett, R. Marsden, H. S. Rogers, H. R. G. Stoney and Sir Archibald V. Board. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2.

Andersay Engineering Co., Ltd.—Registered 9th July. Capital £100. Manufacturers and exporters of and wholesale and retail dealers in and agents for manufacturers of domestic, household and general electrical and other equipment and appliances including washing and cleaning machines, etc. Directors: F. H. Gardner, L. Groom, R. T. Hornsby, J. A. Jephcott and W. Glass. Regd. office: Thames Street, Abingdon, Berks.

Bankruptcies

A. C. Payne, residing at 40, Springfield Road, Wickersley, Rotherham, Yorks, steelworks electrician, and formerly carrying on business at that address as electrical contractor.—Receiving order made 23rd August on debtor's own petition.

H. F. Thorrington, Eydon, Northants, electrical contractor.—First and final dividend of 10½d in the £, payable on and after 9th September at the Official Receiver's office, 58–61, York Terrace, Regent's Park, London, N.W.1.

T. G. Coaton, 16, Humberstone Road, Leicester, electrical engineer, trading as T. G. Coaton & Co.—Supplemental dividend of 2 9/16d in the £, payable on and after 11th September at the Official Receiver's office, 27, Regent Street, Park Row, Nottingham. (Amended notice.)

F. Monk, Ashby Road, Stapleton, Leics., electrical and radio engineer.—Public examination, 15th October at the Castle, Leicester.

T. R. Hugo, carrying on business under the style of Victor Hugo's at 51, Fawcett Road, Southsea, radio and electrical engineer.—Last day for receiving proofs for dividend 4th September. Trustee, Mr. W. H. Meredith, 16, Westwood Road, Southampton, Official Receiver.

F. J. Crutchley, trading as Frank Crutchley at 9, York Street, Hulme, Manchester, previously carrying on business at 304, Deansgate, Manchester, electrical engineer.—First and final dividend of 1s 8½d in the £, payable at the office of the trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2.

Liquidation

B.C.R. Installations, Ltd., electrical contractors.—Winding up voluntarily. Liquidator, Mr. D. Morgan, 100, Park Street, London, W.1, appointed 13th August.

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ELECTRIC SPRAYER

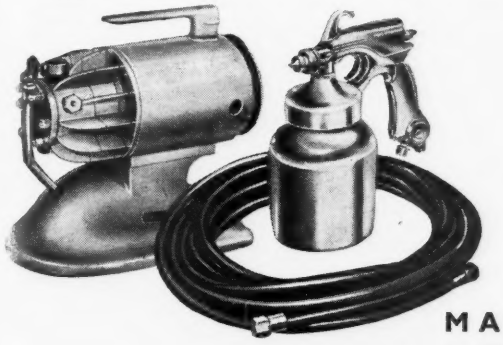
A small, compact and ultra-lightweight unit that will spray almost any medium at speeds up to 1 square yard per minute.

The equipment comprises :

A powerful, sliding vane, automatically lubricated Compressor. A lightweight "bleed" type Gun with a quart size Paint Jar. All necessary Hoses and Connections, bottle of special oil, funnel, set of tools and alternative nozzle.

Weight complete about 22 lbs. Standard voltages : 110, 200/220, 230/250. Special voltages to order.

A pressure feed Container with equipment is available as an extra.



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Regd. Design No. 815,509

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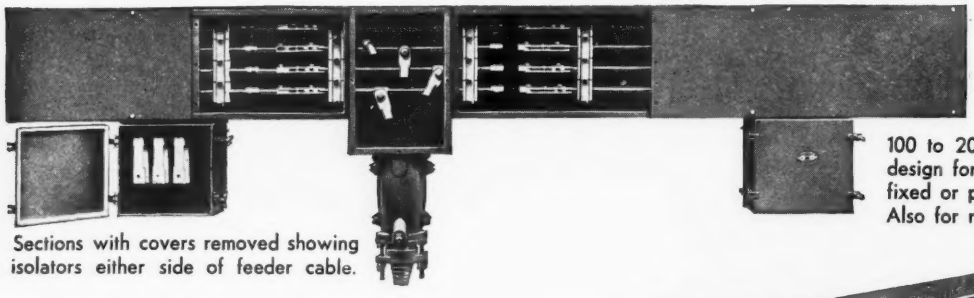
Cable Trunking Busbar Trunking Cable-Tap System Rising Main System
Fuse Units Fuseboards Switchfuses Busbar Chambers Switchboards and Accessories



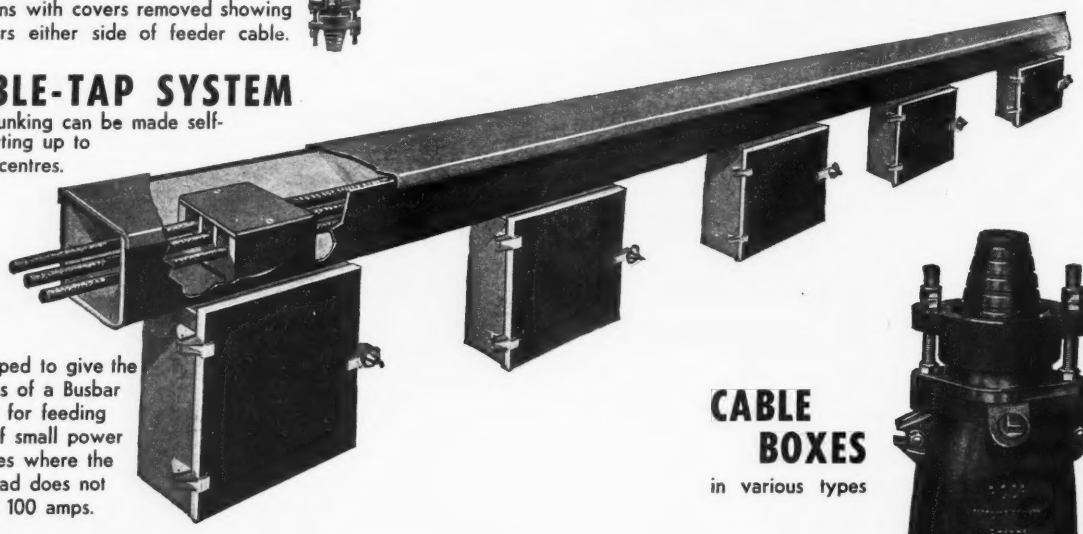
Sections with covers removed showing isolators either side of feeder cable.

BUSBAR SYSTEMS

100 to 2000-amps capacity. A design for all requirements with fixed or plug-in type fuse units. Also for rising mains.

CABLE-TAP SYSTEM

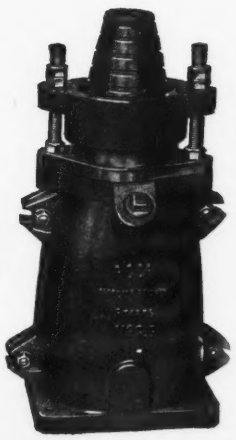
The trunking can be made self-supporting up to 20 ft. centres.



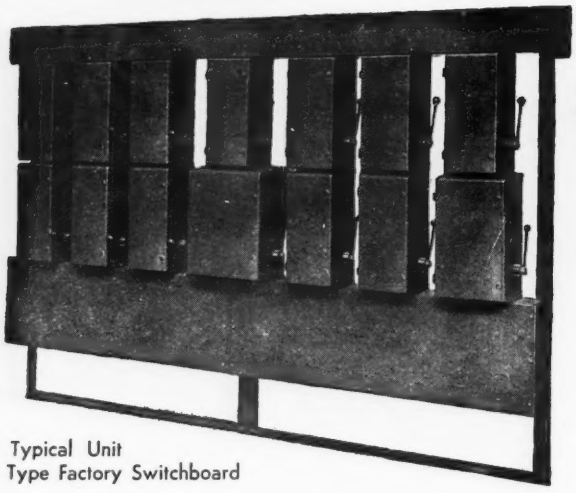
Developed to give the facilities of a Busbar System for feeding rows of small power machines where the total load does not exceed 100 amps.

CABLE BOXES

in various types

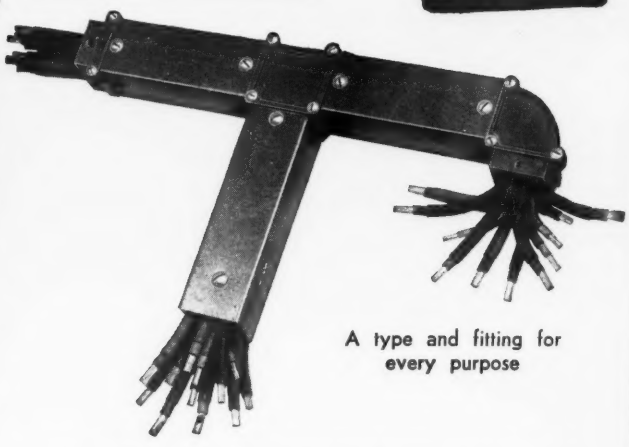


SWITCHBOARDS



Typical Unit
Type Factory Switchboard

CABLE TRUNKING



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GENERATION AND DEVELOPMENT

Proposed Power Station

Plans for a new power station at Blyth, Northumberland, were announced locally last week by the British Electricity Authority, which has applied to the Minister of Fuel and Power for statutory consent to build the station on the north bank of the River Blyth. The station, says the Authority, is planned in two parts, the first of which is estimated to cost £30 million. It will be linked with the new 275 kV supergrid system and will use, at the outset, a million tons of coal a year; when completed it will use about three million tons.

It will be the largest station in the north-east of England, and one of the largest and most efficient in the country. The first unit, which will employ nearly 300 people, is due to be commissioned at the end of 1957 and other units will follow soon afterwards. The first part of the station will contain four 120 MW turbo-alternator sets each with its own pulverized fuel boiler unit. The latest type of dust-extraction plant is to be installed. By this means, it is stated, only a minute portion of the dust in the gases will reach the chimneys. The ash removed from the boilers will be sluiced away for disposal at sea.

Substation Control Equipment

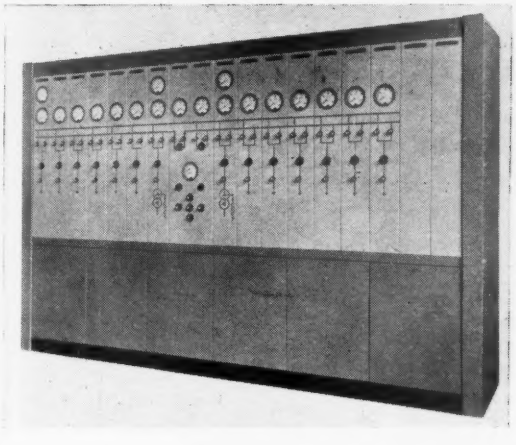
Miniature control equipment, using telephone type apparatus and wiring, is now being installed for the control and indication of the 6·6 kV switchgear at Guildford substation. It has been designed and made by Standard Telephones & Cables, Ltd., for the South Eastern Electricity Board, which has adopted it in preference to the more usual 110 V local control equipment. The compact control board is 10ft 6in long and contains all the apparatus necessary for the control and indication of the 16 breakers.

The South Eastern Electricity Board has installed wall-mounting boxes behind the switchgear, one for each breaker at which the connections to the switchgear terminate, providing means for terminating the telephone-type multi-core cable from the control board. These boxes contain interposing relays, protection relays and secondary current transformers for the meter readings.

Simplicity is the keynote of the design. The control board embodies semaphore-type keys, containing a lamp in the key knob which will indicate any breaker or isolator not in agreement with the semaphore position. Control is carried out by two-stage operation of the individual breaker key, and finally by the manipulation of a " common operate " key situated in the centre of the board.

The compact nature of the equipment allows considerable saving in building accommodation, and the pilot cable runs between the main switch room and the control room are much simplified; thus economies in building costs can be realized. The equipment operates from a 50 V battery installed in the substation.

This miniature control equipment uses telephone type apparatus and wiring and is installed in the Guildford substation of the South Eastern Electricity Board



Venezuelan Hydro-Electric Scheme

Sir William Halcrow & Partners have been appointed to advise the Venezuelan Government on a new hydro-electric project. This is the first time that a British firm has been invited to carry out such work in Venezuela. The Government invited the firm to send out engineers to report on the power potential of the Garoni River and it has now asked for a scheme to be prepared.

Argentine Power Line

The *Fortnightly Review* of the Bank of London and South America reports that the Departamento de Agua y Energia Eléctrica of the Argentine Ministry of Industry and Commerce has called for tenders for the erection of a 132 kV transmission line from the hydro-electric plant to be inaugurated shortly at El Nihuil dam in the Province of Mendoza. This line will be 244 km long on 665 galvanized steel towers with 100 anchorage towers.

Transfer of Small Undertaking

The amount of compensation to be paid in respect of the transfer of a small electricity undertaking was the subject of a recent arbitration award reported in the *Estates Gazette*. The applicant, Mr. F. Dinsdale, had served notice under Section 48 of the Electricity Act, 1947, requiring the North Western Electricity Board to purchase the undertaking which he owned at Dent, Yorks. He claimed £5,715 as the value of buildings, easements, plant and machinery and £2,080 for goodwill. The respondents (the North Western Electricity Board and the British Electricity Authority) contended that the applicant's undertaking did not possess goodwill of any value and that a willing buyer in the open market would have been willing to pay no more than £940, the break-up value of the assets, or £2,340, the second-hand value of the assets *in situ*.

The tribunal (Sir William Fitzgerald, president), in giving its decision, stated that the undertaking had its origin in the desire of Mr. Dinsdale to generate electricity for his own private purposes, which he did by water power plant. In 1934 the supply was extended to other inhabitants and a 42 h.p. engine was installed. Revenue and expenditure figures had been agreed between the parties, but the respondents claimed that if depreciation and the value of the applicant's own time and services were included the undertaking would show a loss. The tribunal agreed that for a limited liability company these standards were proper, but considered that for a " somewhat unique one-man business " a different approach was needed. Compensation was therefore assessed on the basis of the undertaking's being sold as a going concern, with a slight addition to the repairs and maintenance items to cover depreciation. The sum awarded was £3,200.

Street Lighting

Better lighting throughout TWICKENHAM is planned. According to the *Middlesex Chronicle* the total estimated cost is £225,000. The first section, in the Hampton district, where the lighting is to be converted from gas to electricity, is expected to cost £63,000.

PLYMOUTH City Council is recommended to seek approval to borrow £11,215 for converting a further 406 lamps in the Devonport area from gas to electricity.

WEST HARTLEPOOL Council has received £33,036 loan sanction for the conversion of gas lighting to electricity.

DUDLEY Corporation Streets, Transport and Lighting Committee has approved a £1,000 scheme for the provision of 14 sodium lamps in Pensnett Road.

CHICHESTER Corporation is recommended to invite tenders for the provision of street lighting on the Parklands housing site.

DARLINGTON Corporation is recommended to seek sanction to borrow £4,326 for installing street lighting on the Branksome housing estate.

STOCKPORT Corporation is recommended to approve a scheme estimated to cost £2,418, for the conversion from gas to electricity of the street lighting in Greg Street, and Bean Leach Road.

SOLIHULL Town Council is recommended to spend £5,310 on installing lighting in twenty public footpaths.

BEDLINGTON U.D.C. has commenced work on a £17,000 scheme for the provision of 163 new sodium lamps in the area.

BLYTH Town Council has completed the second stage of its electric street lighting improvement scheme, and estimates are being prepared for the third and last stage. It was originally estimated that the work would cost £16,000, but this figure is expected to be considerably exceeded.

DARTFORD Housing Committee has received the consent of the Ministry of Housing and Local Government to borrow £5,930 for the provision of 108 street lamps on the Temple Hill estate.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 13th October from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1950

920. Standard Telephones & Cables, Ltd.—Electrical signalling systems. 13th January, 1950. (716782.) 9226. Selection system for electrical circuits or equipments. 14th April, 1950. (716784.)

14164. Electric & Musical Industries, Ltd.—Voltage stabilization for power supply circuits. 4th June, 1951. (716602.)

15314. Metropolitan-Vickers Electrical Co., Ltd.—Driving arrangements for textile-ring spinning and like frames. 21st May, 1951. (716704.)

27198. Celestin, W. E.—Camera tube and method for television. 7th November, 1950. (716785.)

1951

358. English Electric Valve Co., Ltd.—Electron-discharge devices with thermionic cathodes. 7th December, 1951. (716707.)

2337. Siemens & General Electric Railway Signal Co., Ltd., and Riddle, H. J. N.—Electrical timing devices. 30th January, 1952. (716709.)

5320. Northrop Aircraft, Inc.—Cold-cathode voltage regulator. 5th March, 1951. (716609.)

6894. Philips Electrical Industries, Ltd.—Demodulating circuits for frequency-modulated oscillations. 22nd March, 1951. Addition to 636375. (716712.)

8621. Heinrich, D. O.—Electrostatic precipitators. 21st January, 1952. (716868.)

11793. Osnabruecker Kupfer- und Drahtwerk.—Method for drying electric cable cores by dielectric heat treatment. 21st May, 1951. (716613.)

13055. Pye, Ltd.—Electronic amplifiers operable from either mains or battery supplies. 28th May, 1952. (716873.)

14654. Associated Electrical Industries, Ltd.—Construction of electron guns. 3rd April, 1952. (716716.)

15432. Fairwest (U.K.), Ltd.—Centrifugal electric switches. 18th June, 1952. (716717.)

15997. Grassmann, W.—Apparatus for the electrophoretic or electrolytic separation of mixtures. 5th July, 1951. Addition to 679278. (716875.)

19488. Sylvania Electric Products, Inc.—Electron-discharge device. 17th August, 1951. (716619.)

21420. General Electric Co., Ltd., and Neill, T. R.—Manufacture of cold-cathode gas filled electric-discharge devices. 11th September, 1952. (716621.)

21777. Heinrich, R. F.—Collecting electrodes for electrostatic precipitators. 16th May, 1952. (716622.)

23079. Metropolitan-Vickers Electrical Co., Ltd.—Electrical measuring instruments. 2nd October, 1952. (716721.)

23456. Philips Electrical Industries, Ltd.—Cathode-ray tubes. 9th October, 1951. (716624.)

23974. Pye, Ltd.—Television pick-up tubes. 31st October, 1952. (716625.)

25497. Siemens-Schuckertwerke Akt.-Ges.—Dry rectifiers and processes for the production thereof. 31st October, 1951. (716723.)

25949. Standard Telephones & Cables, Ltd.—Acoustic duct for electro-acoustic transducer. 24th October, 1952. (716801.)

26018. Electric & Musical Industries, Ltd.—Television and similar pick-up tubes. 7th November, 1952. (716627.)

27342. Jackson Electric Stove Co., Ltd.—Electric thermostat control and like knobs. 25th September, 1952. (716726.)

30410. Loewe Opta Akt.-Ges.—Magnetic recording and reproducing device. 31st December, 1951. (716632.)

1952

35. Philips Electrical Industries, Ltd.—Cathode-ray tubes for use in television and line-scanning circuits therefor. 1st January, 1952. (716889.)

693. Philips Electrical Industries, Ltd.—High-frequency electric furnaces. 9th January, 1952. (716891.)

947. Telefonaktiebolaget L. M. Ericsson.—Electric signalling systems. 19th May, 1953. Cognate application 948, 19th February, 1952. (716633.)

1415. Minister of Supply.—Mechano-electronic transducers. 15th January, 1953. (716731.)

1531. Sangamo Weston, Ltd.—Rotary-inductor machines. 18th January, 1952. (716893.)

3847. Skellern, R.—Electric battery terminal connectors. 28th January, 1953. (716896.)

4358. Armour Research Foundation, Illinois Institute of Technology.—Electromagnetic transducer head. 19th February, 1952. (716898.)

4766. Parsons & Co., Ltd., C. A.—Combustion turbines. 13th February, 1953. (716735.)

7335. Imperial Chemical Industries, Ltd.—Production of electric fuses. 19th December, 1952. (716736.)

7378. Standard Telephones & Cables, Ltd.—Coaxial cable termination. 5th December, 1952. (716818.)

8378. International Polaroid Corporation.—Electric lamps. 2nd April, 1952. (716642.)

8551. Klasek, V.—Pressurized electric switches, particularly of the liquid contact type. 3rd April, 1952. Addition to 653343. (716644.)

8964. Metropolitan-Vickers Electrical Co., Ltd.—Beading machines. 7th April, 1953. (716821.)

9375. Fox, P. X.—Variable electrical resistances and potentiometers. 14th July, 1953. (716737.)

9811. British Thomson-Houston Co., Ltd.—Wave guides. 17th April, 1953. (716650.)

9957. General Motors Corporation.—Refrigeration apparatus. 21st April, 1952. (716651.)

10258. Junghans Akt.-Ges., Geb., and Junghans, H.—Electric time switch. 23rd April, 1952. (716824.)

10633. Aircraft-Marine Products, Inc.—Electrical connections and connectors. 28th April, 1952. (716655.)

10683. Elmeg Elektro-Mechanik Ges.—Arrangement for the control of electro-magnetic hammering or battering tools. 28th April, 1952. (716825.)

11654. Philips Electrical Industries, Ltd.—Travelling wave tubes. 8th May, 1952. (716658.)

11978. British Insulated Callender's Cables, Ltd.—Electric cable. 12th May, 1953. (716826.)

13188. Bowaters Development & Research, Ltd.—Pack for a cathode-ray tube or the like. 22nd May, 1953. (716663.)

13456. Siemens-Schuckertwerke Akt.-Ges.—Dry rectifiers. 27th May, 1952. (716742.)

14244. Scintilla, Ltd.—Apparatus for adjusting the speed of rotation of electric motors having a variable desired speed of rotation. 5th June, 1952. (716668.)

14882. Babcock & Wilcox, Ltd.—Combustion apparatus adapted to burn solid fuel in suspension and a method of generating heat and recovering ash from particles separated from gases from such apparatus. 12th June, 1952. (716669.)

15761. Sperry Corporation.—High-frequency oscillator systems. 23rd June, 1952. (716671.)

16571. Siemens-Reiniger-Werke Akt.-Ges.—Anode plate for rotary X-ray tubes. 1st July, 1952. (716834.)

17586. Siemens Bros. & Co., Ltd.—Securing of electrical wiring terminals in insulating blocks. 10th July, 1953. (716747.)

17868. M-O Valve Co., Ltd., and Windsor, L. R. E.—Magnetrons. 15th July, 1953. (716677.)

18862. Akt.-Ges. Brown, Boveri & Cie.—Magnetic induction accelerators for the production of beams of Röntgen rays. 25th July, 1952. (716679.)

19519. Standard Telephones & Cables, Ltd.—Electron tubes. 1st August, 1952. (716684.)

20069. Zenith Radio Corporation.—Television receivers. 8th August, 1952. (716840.)

20136. Carroll-Clark, E. H.—Electrical connector devices. 11th August, 1952. (716686.)

20208. Krautkrämer, J., and Krautkrämer, H.—Method of and apparatus for ultrasonic non-destructive testing. 11th August, 1952. (716687.)

22318. Exhibit Supply Co.—Moisture-tight electrical connectors. 5th September, 1952. (716844.)

26622. British Thomson-Houston Co., Ltd.—Methods of and apparatus for making miniature electric incandescent lamp mounts. 23rd October, 1952. (716698.)

28764. Standard Telephones & Cables, Ltd.—Television receiver circuit arrangement for the separation of the frame synchronizing pulses from the received mixture of line and frame synchronizing pulses. 14th November, 1952. (716763.)

29791. Philips Electrical Industries, Ltd.—Cathode-ray tubes. 25th November, 1952. (716769.)

32935. Krone, G.—Electrical terminals. 30th December, 1952. (716777.) 32936. Electrical terminal boxes suitable for telephone trunk line cables. 30th December, 1952. (716778.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 25th September:—

VISOPHONE. No. 723,608, Class 9. Television apparatus and parts.—Pye, Ltd., Radio Works, St. Andrews Road, Cambridge.

AMPSULATION. No. 729,005, Class 9. Electrical connections.—Aircraft Marine Products, Inc., Harrisburg, Pennsylvania, U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

MAXICON. No. 729,947, Class 9. Electric plugs, sockets and parts.—Painton & Co., Ltd., Bembridge Drive, Kingsthorpe, Northampton.

TRUBLO. No. B729,661, Class 9. Electric fuses.—Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middx.

LEWCOSOL. No. 731,021. LEWTINEX. No. 731,022, Class 9. Insulated wire, fuse wire and resistance wire, all for electrical purposes.—London Electric Wire Co. and Smiths, Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.

PERMABIT. No. 731,185, Class 9. Electrically heated soldering irons.—Light Soldering Developments, Ltd., 30-32, Devonshire Road, Forest Hill, London, S.E.23.

ANCHOR. No. 731,551, Class 9. Radio sets and television sets.—Anchor Investment Co., Ltd., 54, Bridge Street, Manchester, 3.

NEW ELECTRICAL EQUIPMENT

Silicon Carbide Heating Elements

A new type of silicon carbide heating element for use in high temperature electric furnaces is now being made under the trade name "Crusilite" by the MORGAN CRUCIBLE CO., LTD., Battersea Church Road, London, S.W.11. The element comprises a one-piece silicon carbide tube in which the central hot zone is in the form of a spiral of the requisite length. It is suitable for working over a wide range of element temperature from 800 deg C to 1,575 deg C. Its rate of increase of resistance in use is relatively slow, which shows a considerable advance on earlier types.

The strength of the material used in its manufacture is such that a highly efficient terminal arrangement can be used. At present available for the 10 and 14 mm diameter elements only, this consists of metal terminal caps shrunk on to the metallized ends of the elements. In some furnaces where space is restricted, it may not be possible to make use of these terminal caps. In such cases the elements can be supplied with metallized ends only. Dispatches from manufacturers' stocks will be within a tolerance of ± 10 per cent of the nominal, but the resistance of all elements supplied as a set for any particular furnace will not vary more than ± 5 per cent of the mean.

Earth Leakage Circuit Breaker

The new 60 A double pole earth leakage circuit breaker for use on consumers' premises which is being made by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., 51–53, Hatton Garden, London, E.C.1, is of neat and compact design, the overall dimensions being only $5\frac{5}{16}$in by 3in by $3\frac{1}{16}$in deep.

Henley 60 A double pole earth leakage circuit breaker

Instead of the usual handle it is operated manually by a vertical slide of the "free-handle" type so that it is impossible to hold it in the "on" position under fault conditions. The circuit-breaker mechanism is mounted on a substantial high-grade insulating base which does not form part of the outer casing; thus, in effect, the breaker is housed in a separate case similar to a meter.

The well-known Henley principle of using the leakage current for closing a secondary circuit connected directly to the mains ensures plenty of power to open the main contact and the use of delicate mechanism is thus avoided. All springs are made from phosphor bronze, while all ferrous parts are cadmium coated and the lead-out connections from the coils are reinforced. The supply terminals will take cables up to 0·04 sq in and the terminals for the frame and earth connections cables up to 0·01 sq in. The main contacts are silver-to-silver. A test button is provided for periodical tests of the trip mechanism and a spark gap protects the trip coil.

Potato Peeler

The "Trojan" potato peeler introduced recently by CRYPTO, LTD., North Circular Road, London, N.W.10, embodies a close mesh abrasive prepared from a mixture of carborundum and Bakelite cement which is baked on to the walls of the peeling chambers and on the peeling plate. This feature not only makes for quicker peeling but minimum loss of weight. For a 7/10 lb peeler it is compact in size, being only $17\frac{3}{4}$in high, $24\frac{3}{4}$in long and 16in wide. It weighs 142 lb.

Ease of access has been well studied. The $\frac{1}{4}$ h.p. motor is enclosed by a cast iron cover released by one thumbscrew; lifting hooks are provided for the removal of the peeling plate and the door handle has a simple up and down movement which automatically provides a watertight closure.

Crypto "Trojan" potato peeler

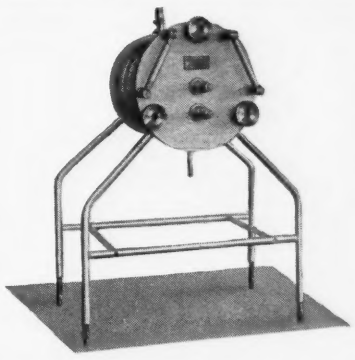
Earth Leakage Protection

The "Safetrip" earth leakage protective device, recently introduced by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38–39, Upper Thames Street, London, E.C.4, consists of a 15 A double-pole earth leakage circuit breaker controlling a 13 A shuttered socket outlet. Complying with B.S. 842 and B.S. 1363, it can be supplied for either flush or surface mounting and operation of the circuit breaker is by means of "on" and "off" push-buttons. A "test" button is also provided for electrically tripping the breaker. Giving protection against shock on sub-circuits, the breaker is suitable for portable appliances or any apparatus consuming up to 3 kW. The switch socket measures $5\frac{3}{16}$in by $3\frac{7}{16}$in by $1\frac{13}{16}$in overall, and has a moulded face plate behind which is mounted the totally enclosed switch mechanism and socket outlet. Also available as a separate unit without the shuttered socket, the "Safetrip" can in this form be used with existing sockets already installed or as a safety control switch.

Siemens "Safetrip" shuttered socket outlet

Metal Processing Furnaces

For some years ELECTRO-ALLOYS, LTD., 47, Brunel Road, Acton, London, W.3, have been engaged in the manufacture of tungsten and molybdenum products and



Electro-Alloys vacuum furnace for temperatures up to 1,500 deg C

when processing these materials, molybdenum or tungsten wound high-temperature furnaces of their own make have been used. The company has now decided to market these furnaces to customers' specifications. Furnaces will be available both for use in controlled atmospheres and *in vacuo*, the present programme covering a horizontal laboratory vacuum furnace, a small hydrogen furnace and an automatic one for large scale manufacture of small components.

Goods Transport Guide

Following denationalization, traders can now use free-enterprise long-distance road transport services. The names, addresses and telephone numbers of the people who operate them are contained in the July-December "ABC Goods Transport Guide" just published by *Motor Transport*. It also contains numerous entries covering hauliers who, while not operating regular time-table services are, nevertheless, in a position to carry any goods anywhere, any time. Other sections of the Guide give details of "smalls" or parcels services and the addresses and telephone numbers of clearing houses; machinery carriers; bulk liquid carriers, etc. The Guide—3s 6d including postage—can be obtained from all newsagents, or direct from Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Antrim.—23rd September. County Education Committee. Electrical installation at new primary school, Larne. A. N. Irens, consulting engineer, 58, Howard Street, Belfast.

Australia.—MELBOURNE.—22nd September. State Electricity Commission of Victoria. Voltage regulating equipment. (E.S.B. 20280/54. Ten/10390.)* 15th September. Six 66 kV potential transformers. (E.S.B. 20279/54. Ten/10397.)*

SYDNEY.—20th September. Electricity Commission of New South Wales. One 11 kV 50 cycle, 3-phase shunt capacitor bank rated at 3 MVA. (E.S.B. 20451/54. Ten/10439.)*. 27th September. One 33 kV 30 MVA regulating transformer. (E.S.B. 20453/54. Ten/10441.)* Four 15/15 MVA transformers. (E.S.B. 20452/54. Ten/10425.)*

Bacup.—22nd September. Corporation. Street lighting equipment. (See this issue.)

Belfast.—24th September. Street lighting equipment. (See this issue.)

Billericay.—U.D.C. Street lighting equipment. (See this issue.)

Dundee.—22nd November. North of Scotland Hydro-Electric Board, Dundee Area. One steam-driven boiler feed pump and one electrically-driven boiler feed pump. (See this issue.)

Durham.—County Education Committee. Electrical installations in Dunston Hill County and Modern Schools and Greatham C.E. (Cont.) School. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. 132 kV overhead line construction. (See this issue.)

Formosa. — TAIPEI. — 21st September. Outdoor bus conductors, bus supports and fittings and metalclad switchgear. (E.S.B. 20432/54. Ten/10434.)*

India. — BANGALORE. — 14th September. Stores Purchase Committee, Government of Mysore. Transmission line materials. (E.S.B. 20269/54. Ten/10395.)*

NEW DELHI.—28th September. Director General of Supplies and Disposals. Transmitting and spares. (E.S.B. 20386/54. Ten/10414.)* 30th September. V.h.f. transmitting/receiving station equipment. (E.S.B. 20405/54. Ten/10413.)* 13th October. Radio telephone and telegraph transmission and receiving equipment. (E.S.B. 20387/54. Ten/10418.)*

RAYJASTHAN, JAIPUR. — 15th September. Government Electrical and Mechanical Department. Diesel generating plant, auxiliaries* switchgear, cables, etc. (E.S.B. 20568/54. Ten/10448.)*

Indonesia. — DJAKARTA. — 15th September. Ministry of Economic Affairs. Electric motors, motor starters, meters and transformers. (E.S.B. 20659/54. Ten/10485.)* Four centrifugal, electric motor driven water pumps. (E.S.B. 20707/54. Ten/10471.)* 30th September. Steam boilers. (E.S.B. 20709/54. Ten/10483.)* Laboratory equipment. (E.S.B. 20704/54. Ten/10484.)*

Middlesex.—13th September. County Council. Supply of electric lamps for the year ending 31st October, 1955. (See this issue.)

18th October. Electrical equipment, for the East Middlesex main drainage scheme. J. D. & D. M. Watson, engineers, 18, Queen Anne's Gate, Westminster, S.W.1.

Newark - on - Trent.—23rd September. Corporation. Street lighting equipment. (See this issue.)

New Zealand.—AUCKLAND.—24th September. Auckland Electric Power Board. 50,000 yd of bare hard drawn stranded cable. (E.S.B. 20406/54. Ten/10412.)*

WELLINGTON.—12th October. Stores Division, G.P.O. Valves. (E.S.B. 20397/54. Ten/10417.)*

30th September. Post and Telegraph Department. Cathode ray tubes and valves. (E.S.B. 20395/54. Ten/10422.)*

Reading.—25th September. Corporation. Electrical installations in 103 houses. (See this issue.)

St. Albans.—28th September. Corporation. Street lighting installations. (See this issue.)

South Africa.—JOHANNESBURG.—15th September. Stores Department, South African Railways. Underground telephone cable. (E.S.B. 20354/54. Ten/10399.)* 22nd September. Telephone equipment. (E.S.B. 20357/54. Ten/10401.)*

PRETORIA.—30th September. Union Tender and Supplies Board. Magneto telephones. (E.S.B. 20367/54. Ten/10402.)* 30th September. Radio valves, antennas and speaker cabinets. (E.S.B. 20459/54. Ten/10431.)*

Southern Rhodesia.—BULAWAYO.—15th September. Municipality. Forty-two transformers ranging from 30 to 500 kVA. (E.S.B. 20439/54. Ten/10440.)*

Tangier.—15th October. Water and Electricity Supply Board. L.v. overhead line. (E.S.B. 20165/54. Ten/10385.)*

United States.—DENVER.—16th September. U.S. Bureau of Reclamation. One 750 kVA voltage regulator. (E.S.B. 20048/54. Ten/10410.)*

Uruguay.—MONTEVIDEO.—5th October. Administracion General de las Usinas Electricas y los Telefonos del Estado. 25,000 dry batteries. (E.S.B. 20699/54. Ten/10474.)* 6th October. Lead covered cable. (E.S.B. 20698/54. Ten/10491.)*

ORDERS PLACED

Cardiff.—Transport Committee. Recommended. Underground cable for the Ely trolley-bus extension scheme (£6,669).—Aberdare Cables.

Derby.—Corporation. Electrical installations in 100 Unity houses at Mackworth (£2,150) and 104 houses at Harvey Road (£2,250).—A. J. Dyer & Sons.

London.—London County Council. Electrical installation at John Rennie primary school, Stepney (£2,880).—Carlin Engineering Co., Ltd.

Wallasey.—Education Committee. Electrical installation work at Secondary Technical School for Boys, Mosslands Drive (£6,543).—Parry's.

Walthamstow. — Corporation. Electrical installations at The Drive (£2,896). — Hancock & Co. (Leyton).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Burslem (Staffs).—Factory extensions, William Clowes Street; Acme Marls, Ltd., Clough Street, Hanley, Stoke-on-Trent.

Buckinghamshire.—Grammar schools at Langley (£168,300) and Bletchley (£118,800), secondary modern school at Princes Risborough (£90,000) and county junior school at Far Bletchley (£51,392); F. A. Maunders, county architect, Walton Street, Aylesbury.

Dudley.—Houses (170), Sledmere estate; Webb & Gray, architects, Tixall House, St. James's Road, Dudley.

Gateshead.—Factory addition, Team Valley, for Forgrove Eng. Co., Ltd.; S. W. Milburn & Partners, architects, 9, Esplanade, Sunderland.

Hereford.—Drill hall and offices; Scriven, Powell & James, architects, Cathedral Chambers, King Street.

Leeds. — New offices, Westgate, for Brotherton & Co., Ltd.; Victor Bain, architect, 3, Queens Square.

Leicester.—R.C. Secondary School, Gwendolen Road; city architect.

London.—BATTERSEA.—Factory; University Tailors, Ltd., Wandsworth Road, S.W.8.

BERMONDSEY. — Reinstatement of Town Hall; borough engineer, Municipal Offices, Spa Road, S.E.16.

CITY.—Office block, Leadenhall Street; A. E. Symes, Ltd., builders, 1a, Carpenters Road, E.15.

LAMBETH.—Extensions and alterations to Lambeth Hospital; Geo. Lowe, architect, 4, High Street, Croydon.

WANDSWORTH.—Dwellings (151), West Hill estate; Sir Lancelot Keay, architect, 80, Wimpole Street, W.1.

Maidstone.—Fire station, Loose Road (£64,000); Kent county architect, Springfield, Maidstone.

Newcastle-on-Tyne.—Reconstruction of four storey block of premises, Blackett Street, for Phillips & Co., London; Holland & Hannen and Cubitts, 5, Royal Terrace, Edinburgh.

Northumberland.—Additions to workshops, etc., at Benton (£79,000); county surveyor, Queen Street, Newcastle-on-Tyne.

Technical school in south-east of county (£207,500); county architect, County Hall, Newcastle-on-Tyne.

Police station at Hexham (£56,000); county architect.

Plymouth.—Multiple stores on the Cornwall Street/Armada Way site; British Home Stores, 129, Marylebone Road, London, N.W.1.

Factory additions, Alexandra Road; Brown Wills & Nicholson, wholesale grocers and food manufacturers, Beechwood Factory.

Salford.—Extensions to factory at Langley Road, Pendleton, for U.M.P., Ltd.; Matthews & Co., Ltd., 129, Stockport Road, Manchester.

Scunthorpe.—Houses (224), Manor Farm estate; borough architect.

Offices in Queensway; Orthostyle, Ltd., engineers, Ashby, Villa Road.

Southsea.—Offices with flats over, King's Road; Geo. Peters & Co., Ltd., Katwynn House, Landport Terrace, Portsmouth.

Stretford.—C. of E. Church, Barton Road; Leach, Rhodes & Walker, architects, 90, Deansgate, Manchester.

Swindon. — Factory, Lowestoft Street; Garrard Engineering & Manufacturing Co., Ltd., Newcastle Street.

Uxbridge.—Office block, Bakers Road; Allen Fairhead & Sons, Ltd., Sydney Road, Enfield.

Wallasey. — Factory extension, Pasture Road, Moreton; Cadbury Bros., Ltd., Bournville, Birmingham.

West Bromwich.—Erection of factory and offices in Lyng Lane; Retsam Co., Ltd., 28, Newhall Hill, Birmingham, 1.

West Hartlepool.—Proposed Brierton County Secondary School; Cairns & Byles, electrical consultants, 8, Osborne Road, Newcastle-on-Tyne.

Whitehaven. — Factory additions for Marchon Products, Ltd.; Ronald Ward & Partners, architects, 33, St. George's Drive, London, S.W.1.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

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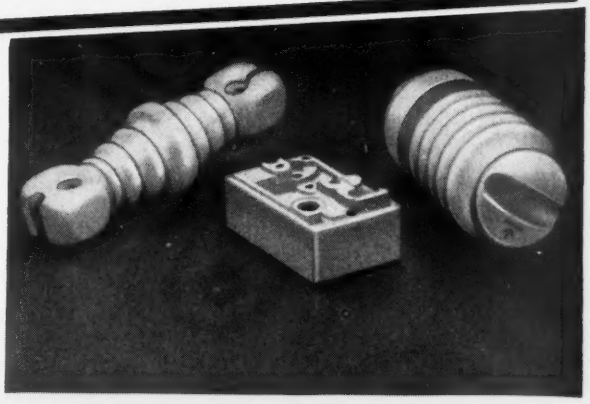

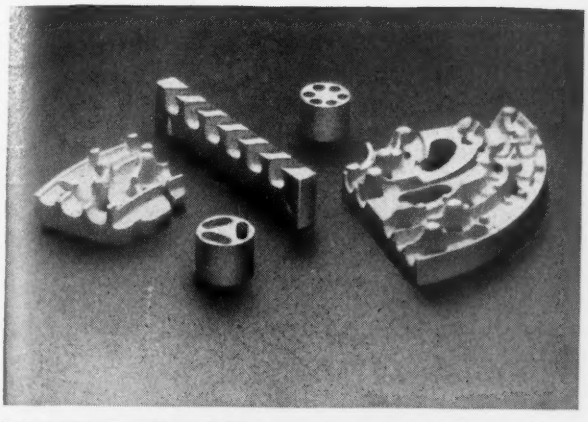

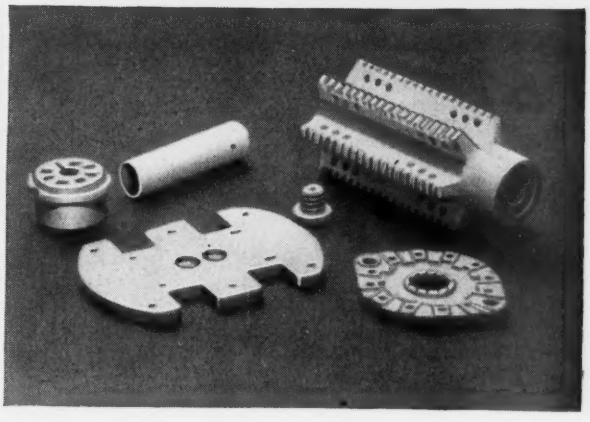

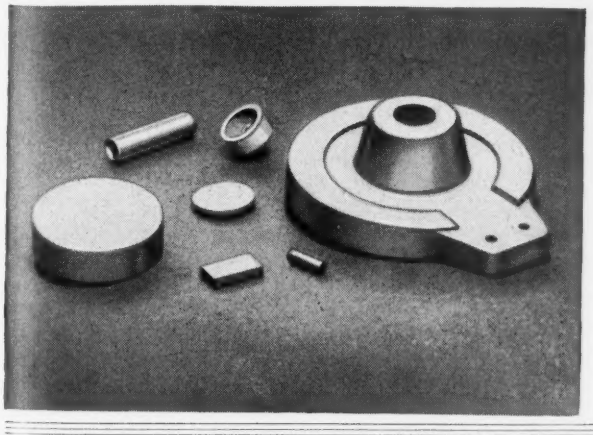

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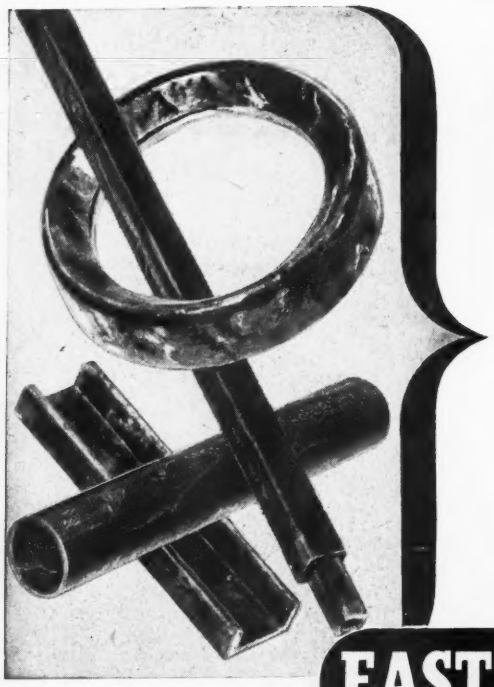

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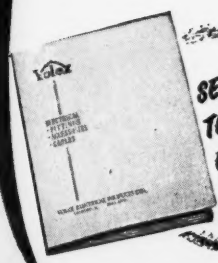

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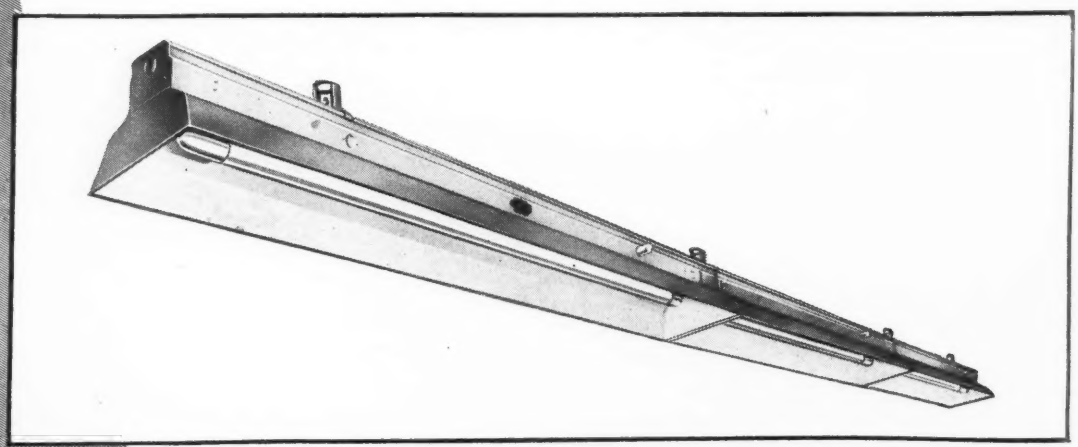

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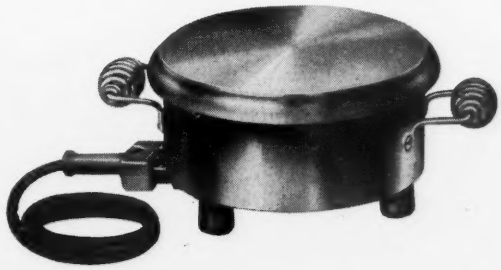

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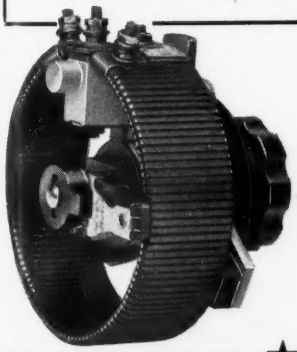

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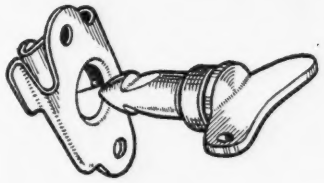

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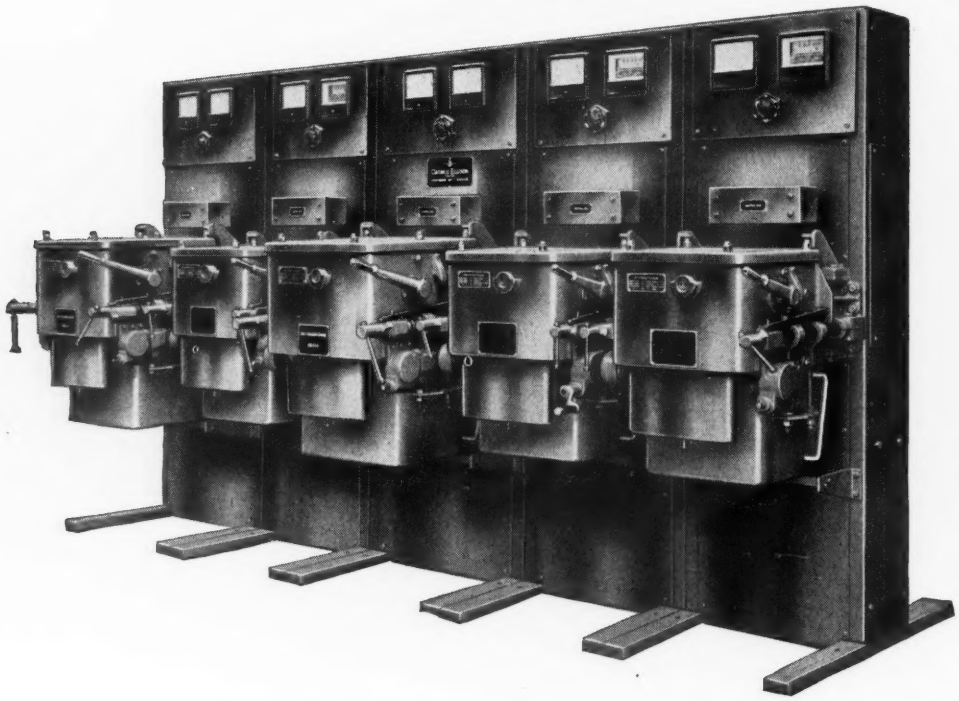

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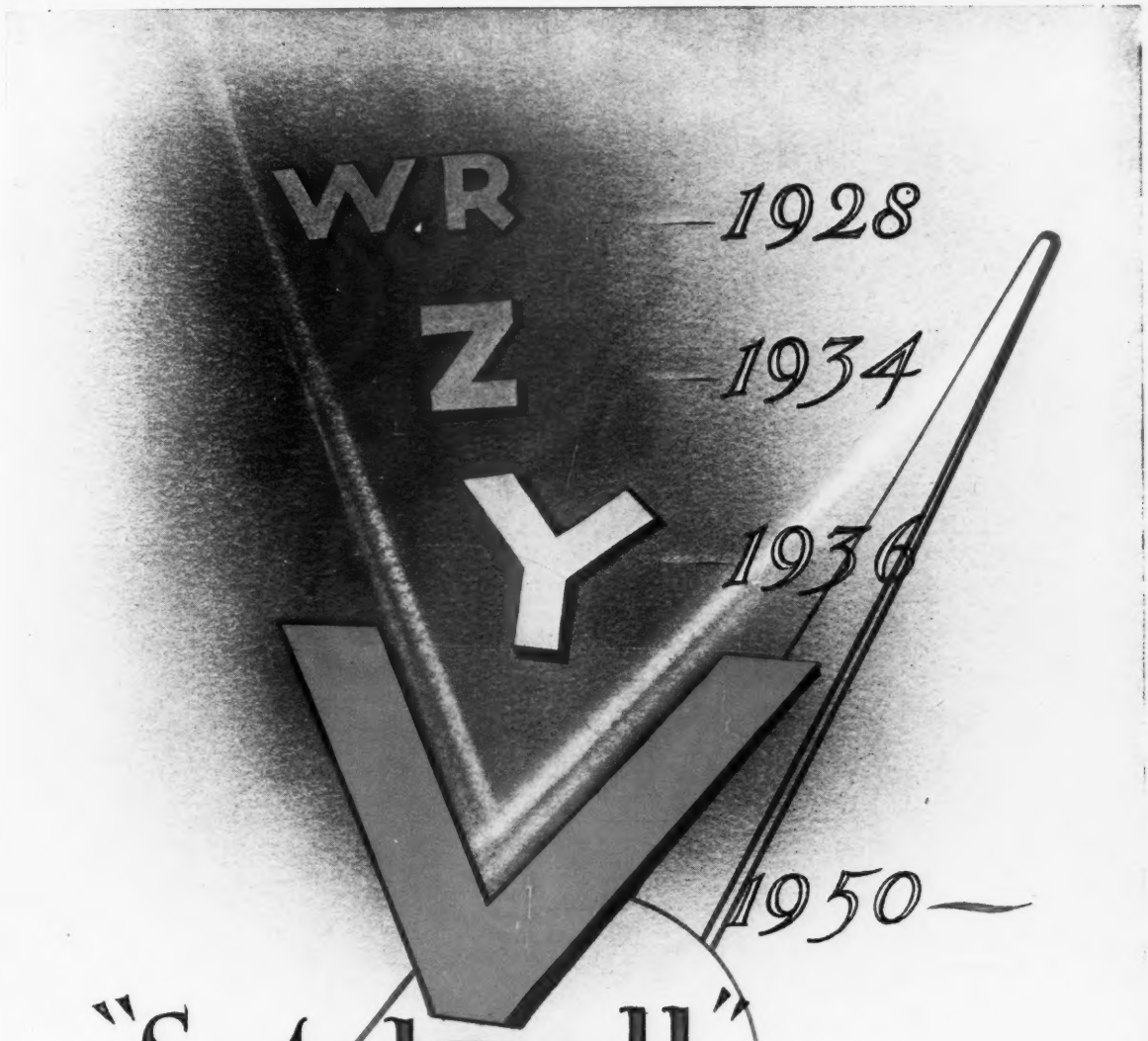

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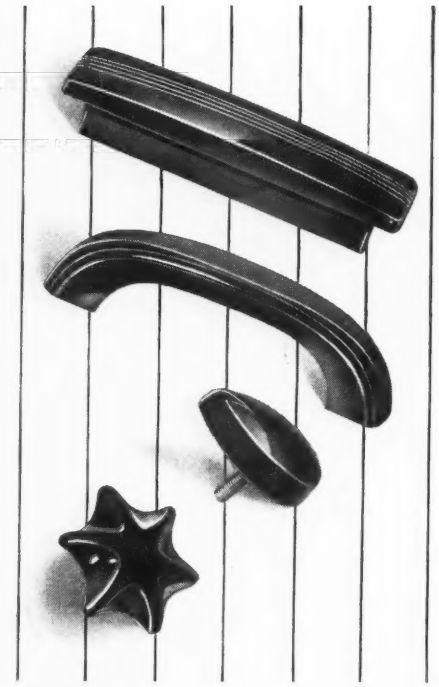

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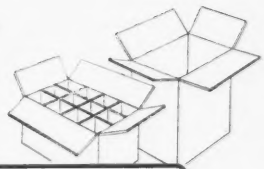

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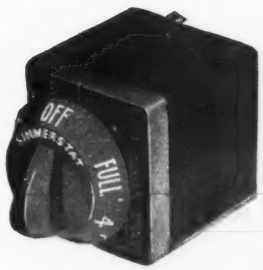

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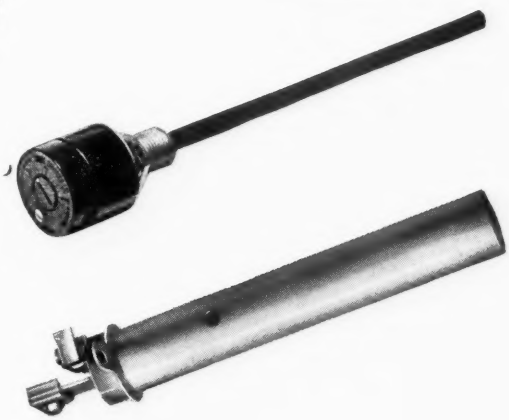

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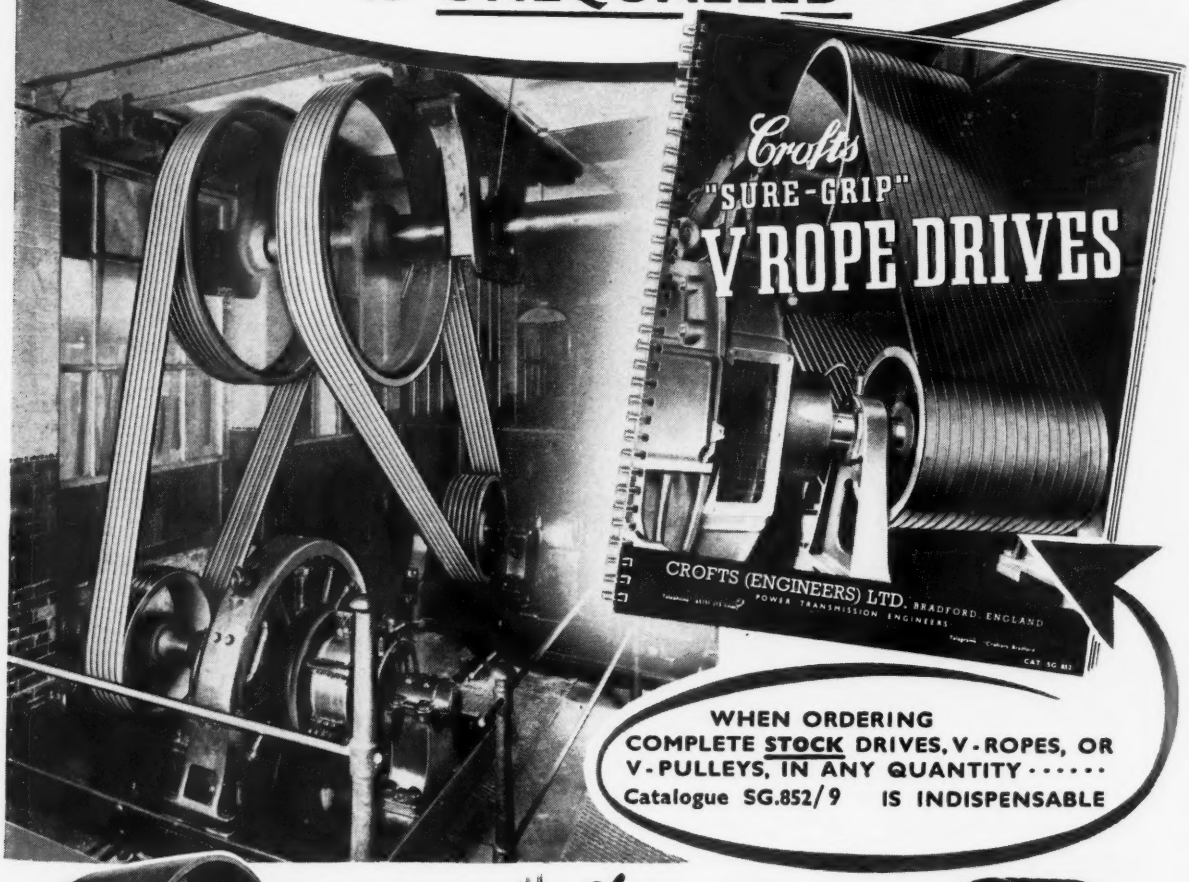

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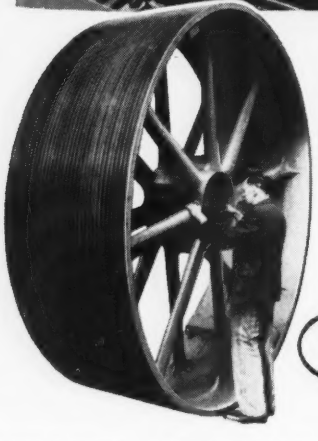

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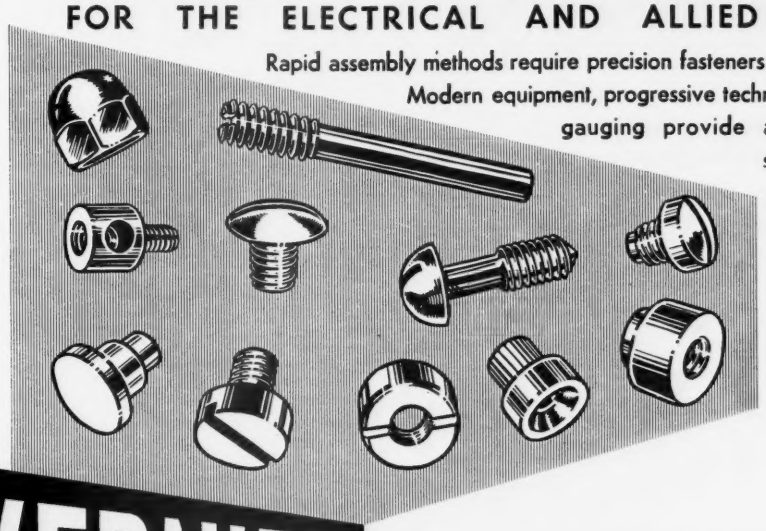

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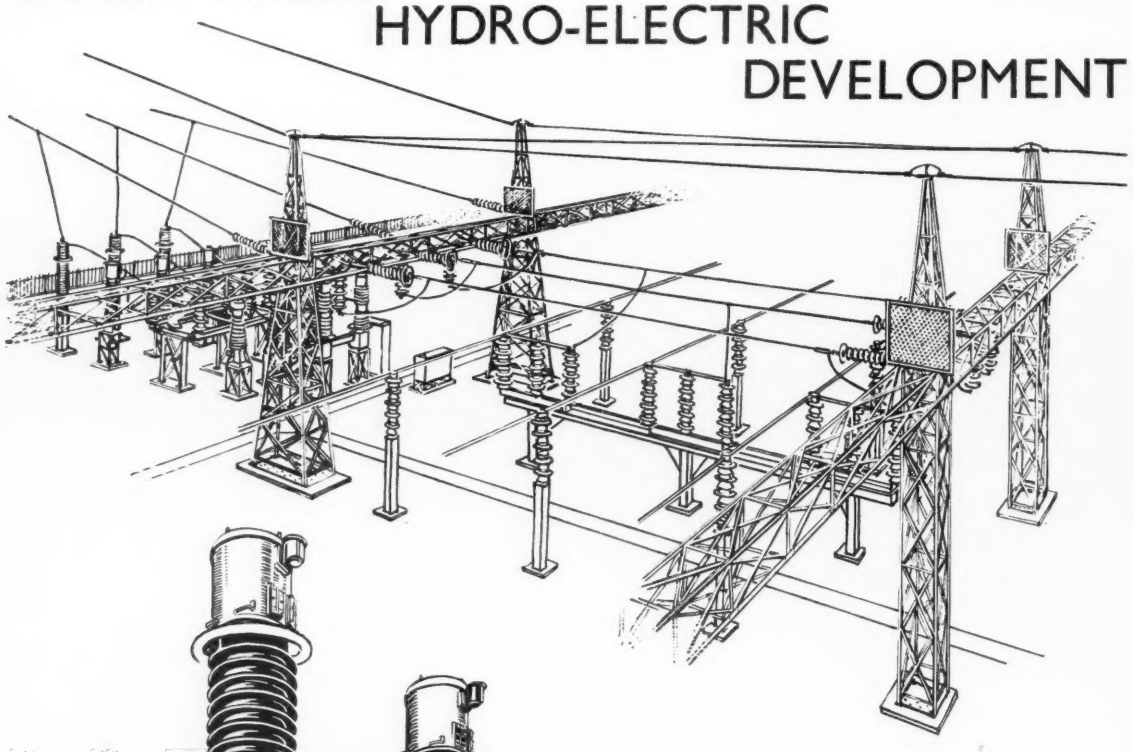

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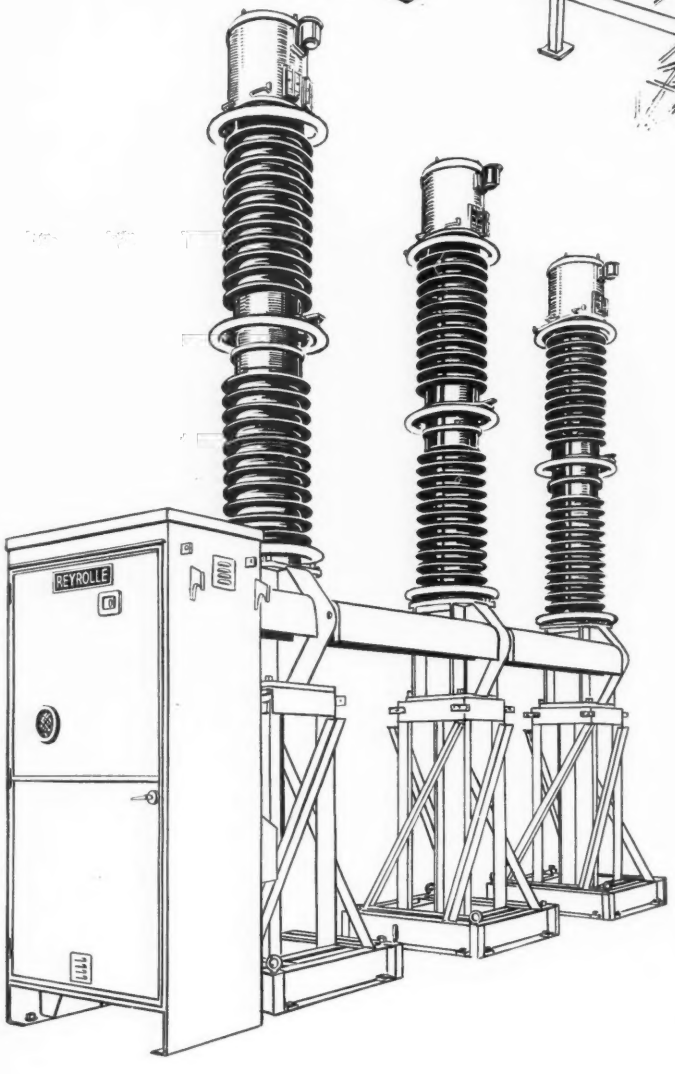

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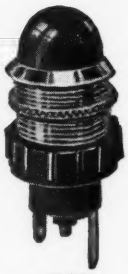
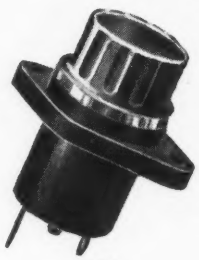

SL90

SL86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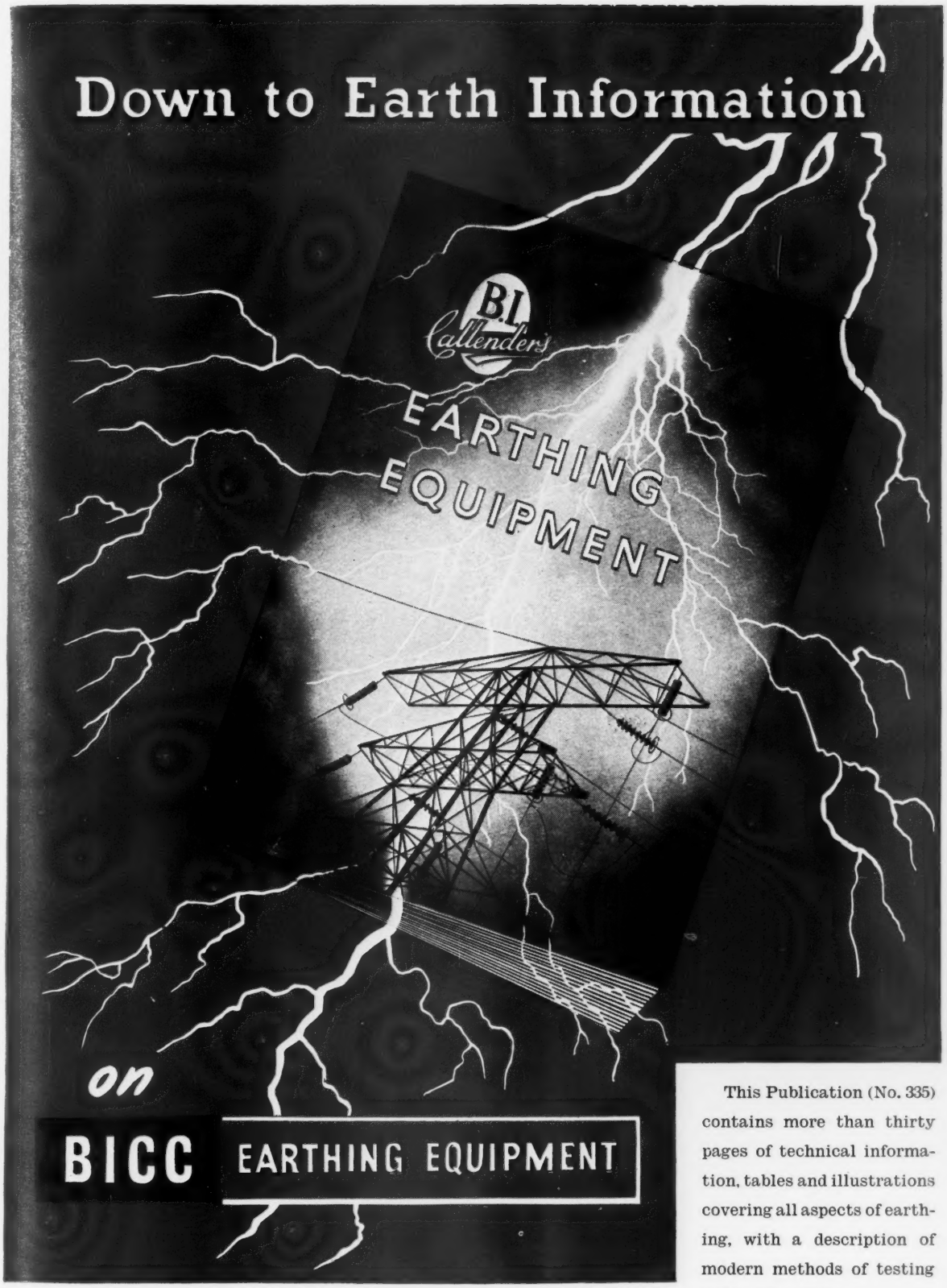

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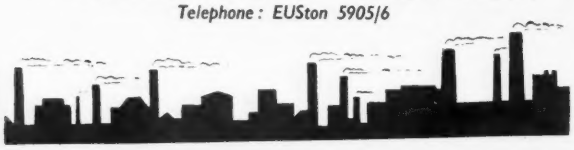

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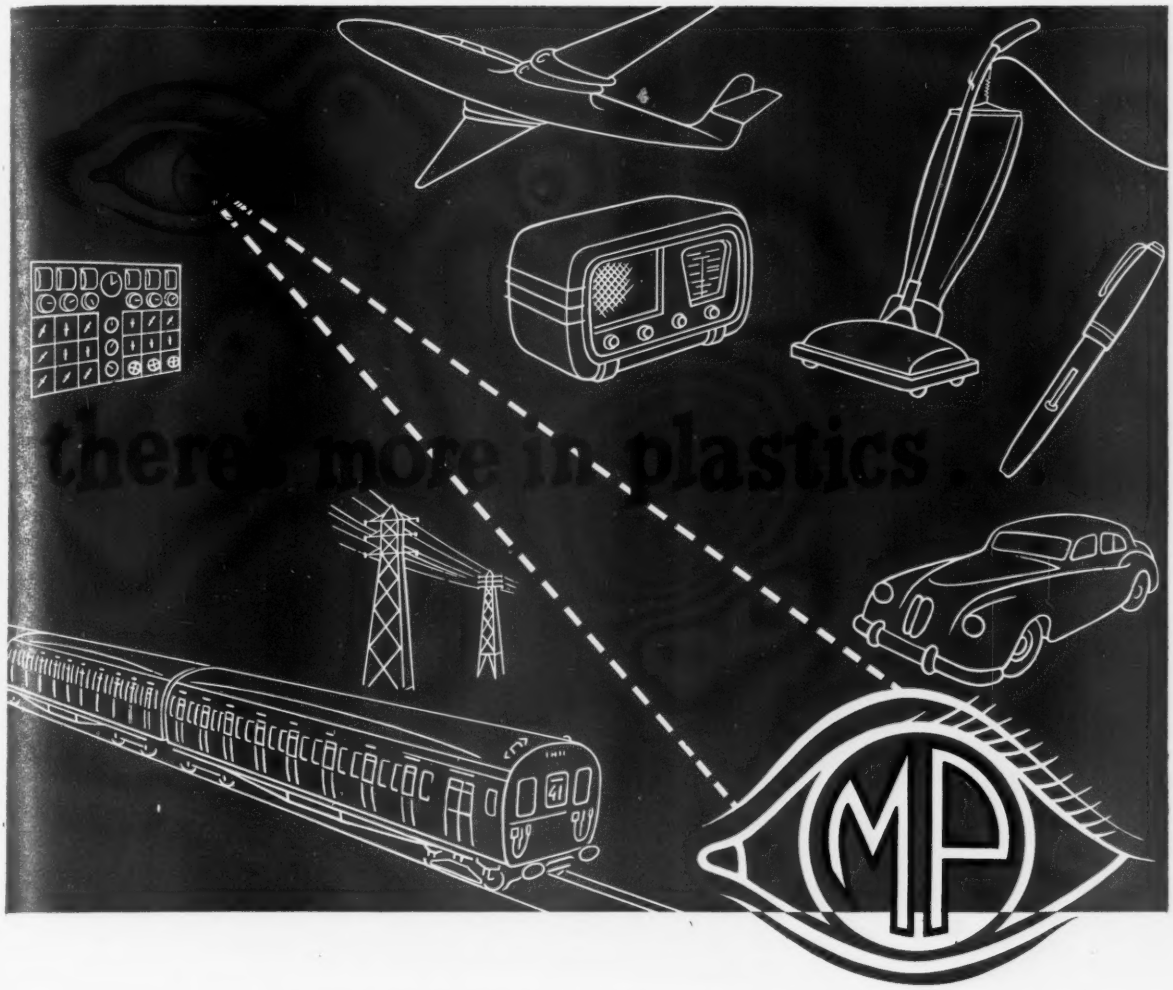

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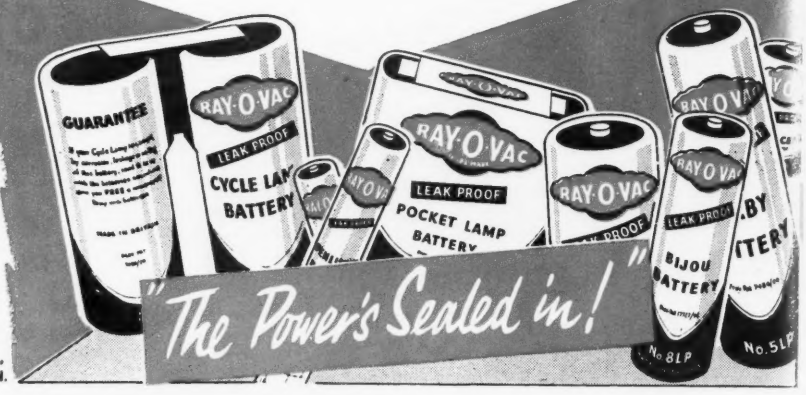

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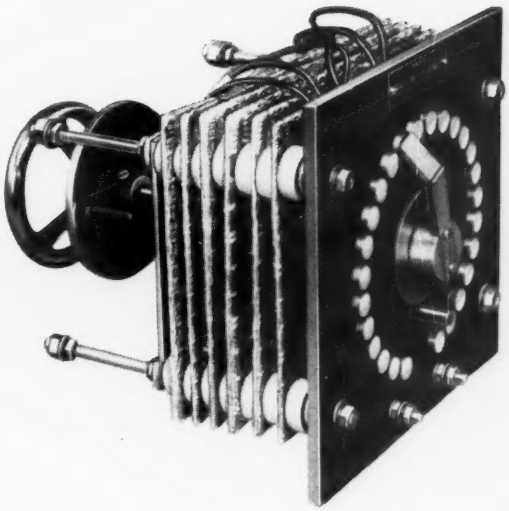

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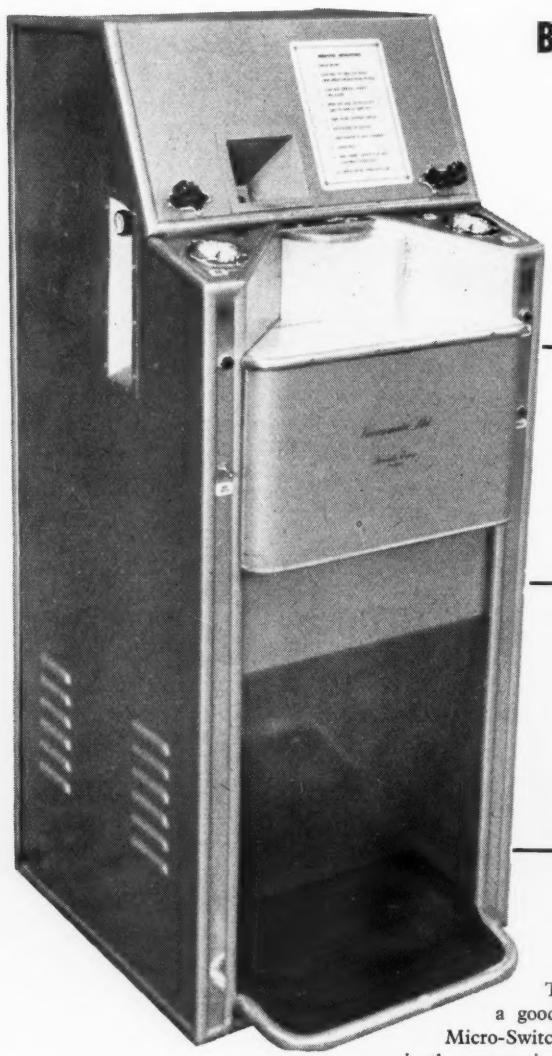
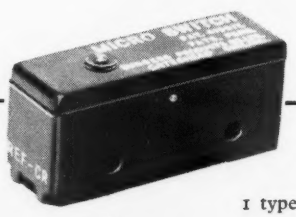
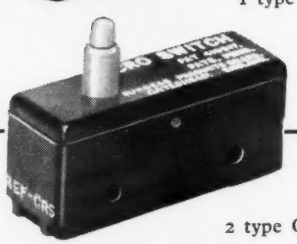
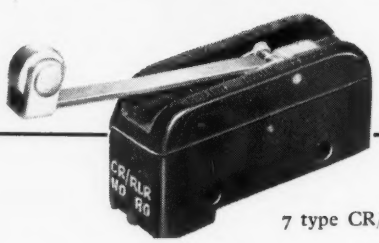




1 type CR



2 type CRS



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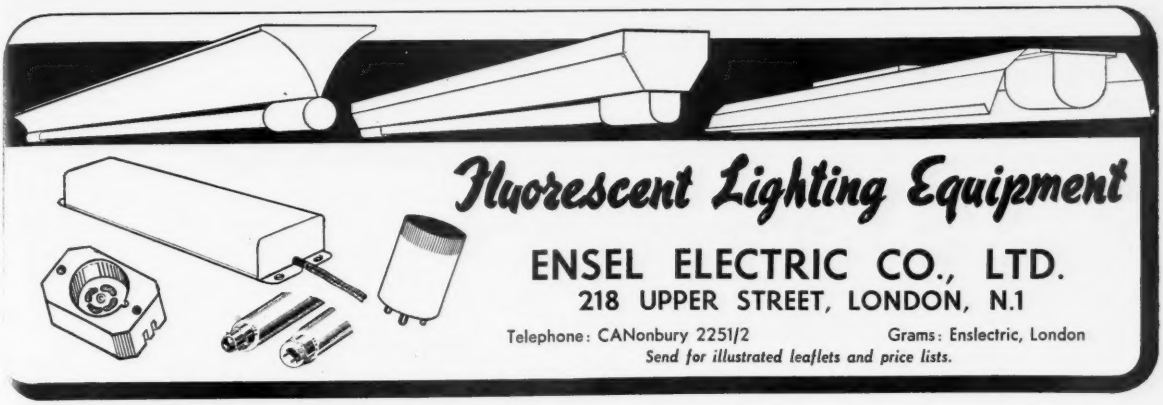

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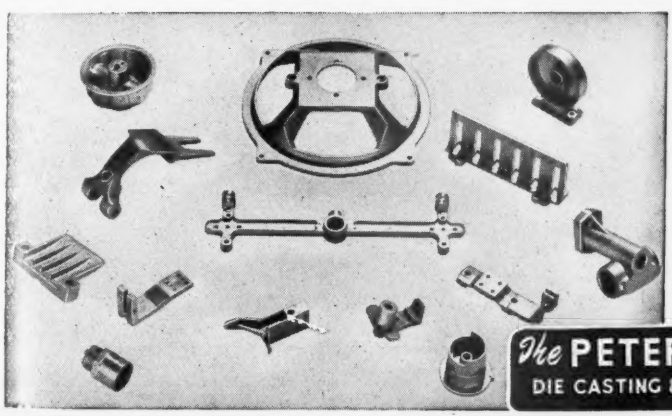

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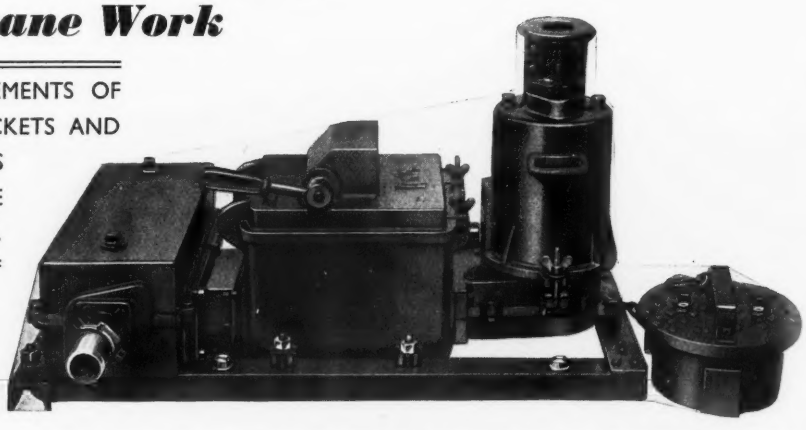

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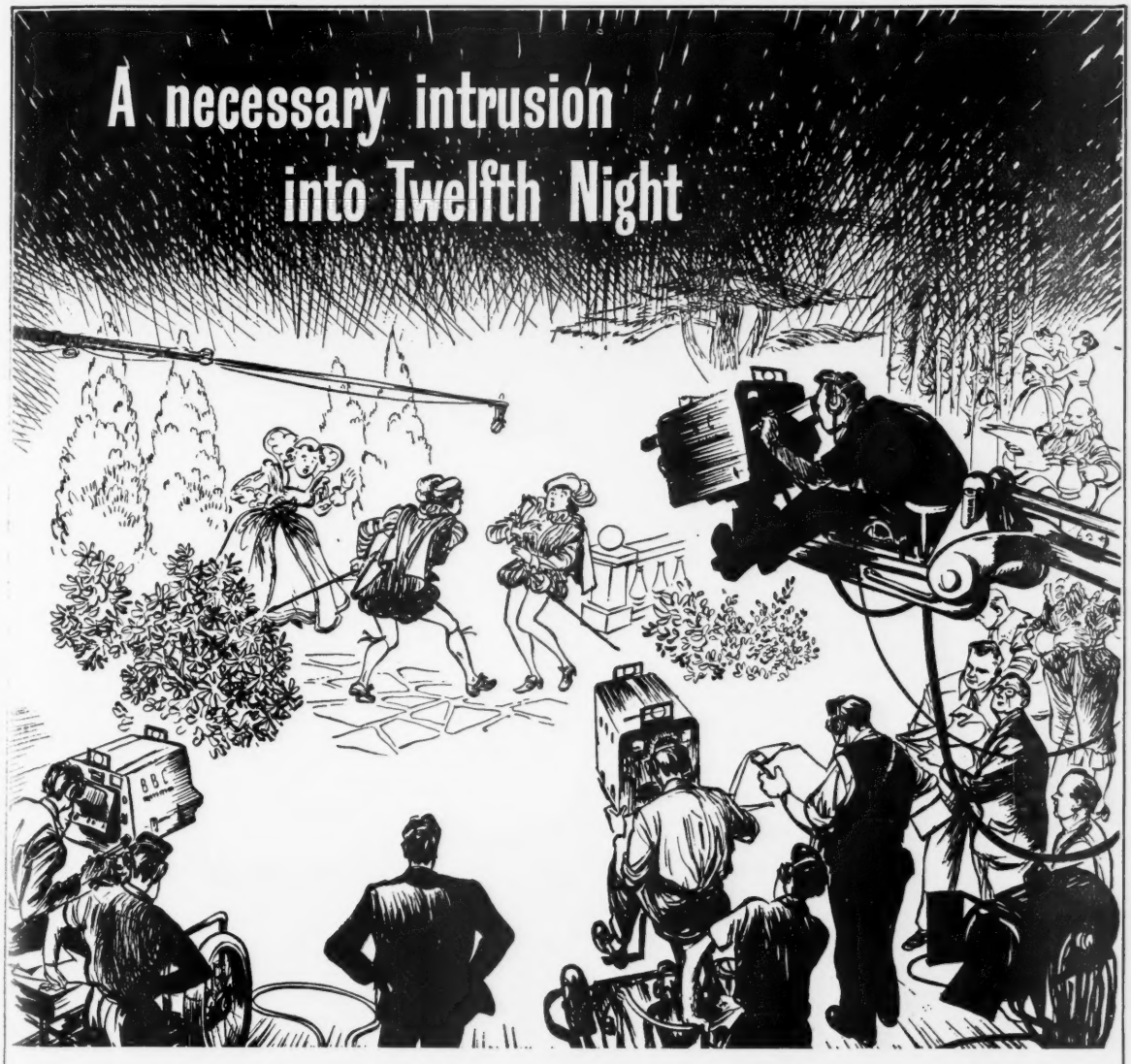

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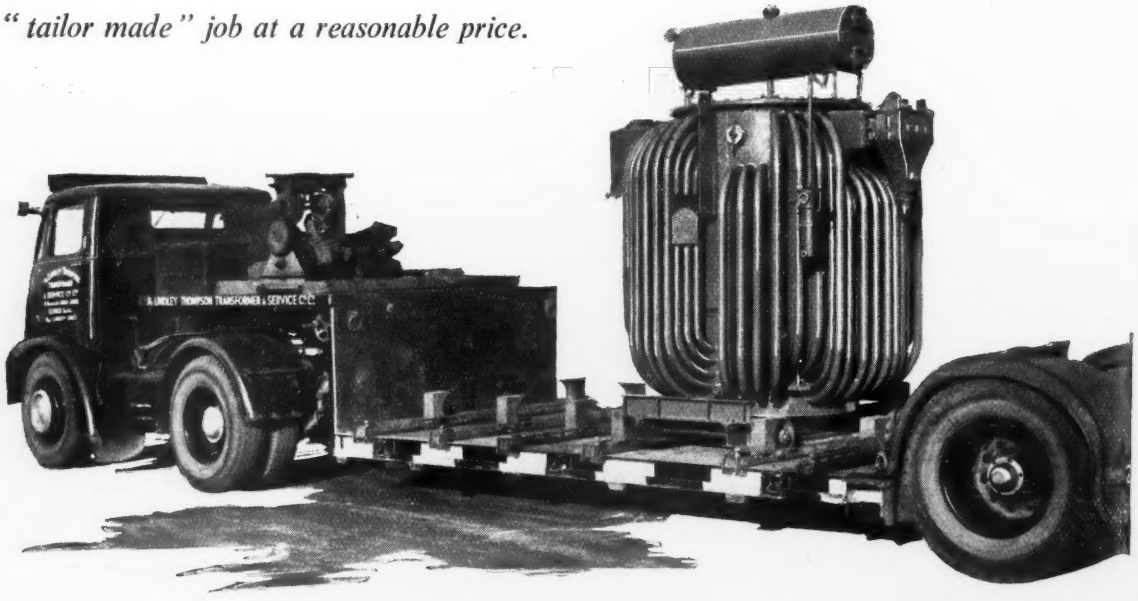

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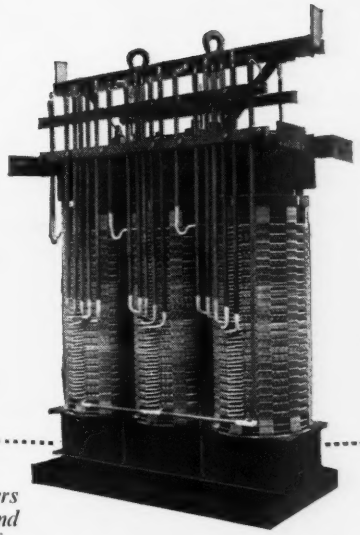

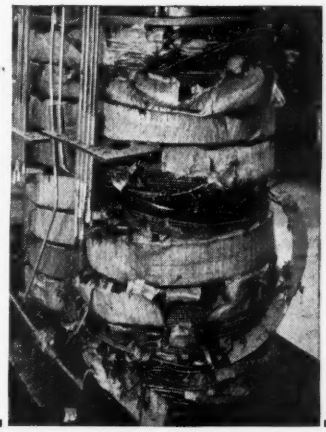

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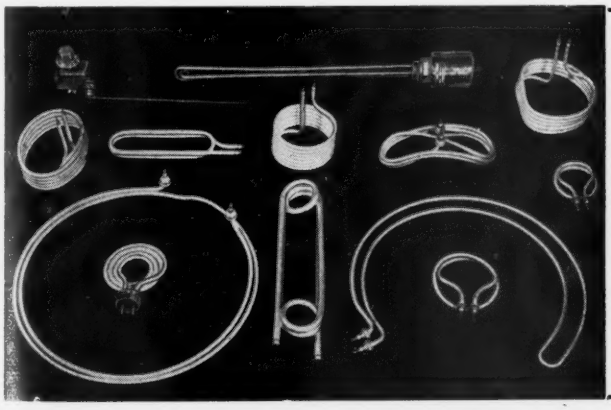

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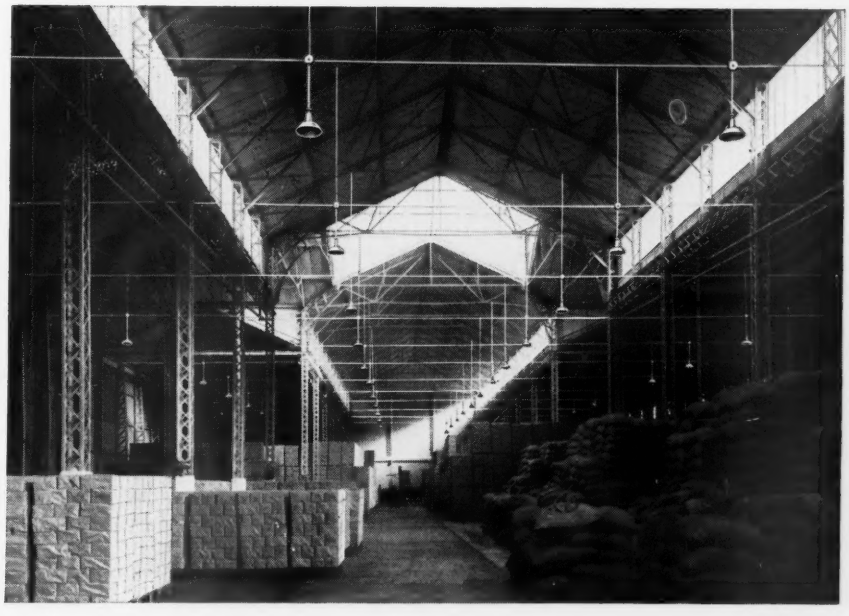

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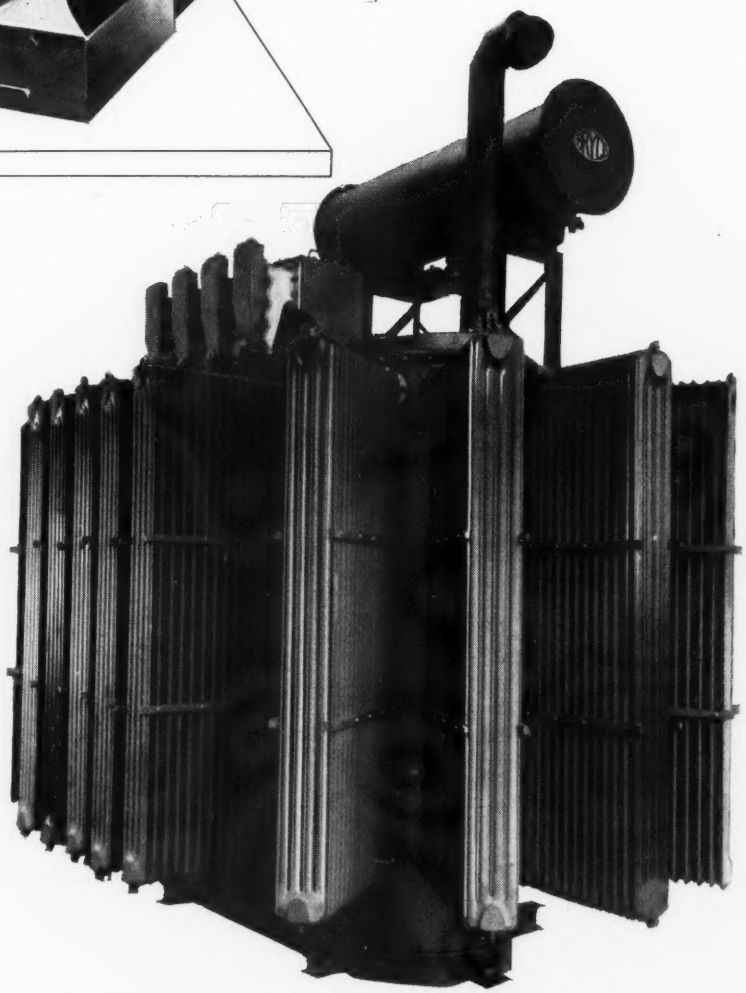

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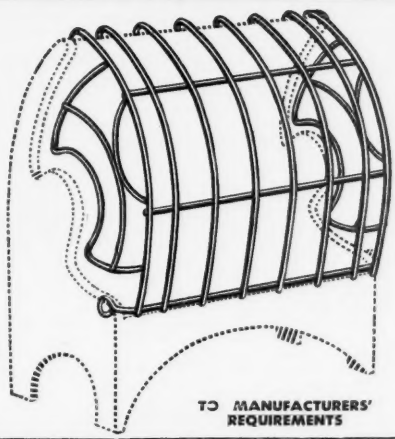

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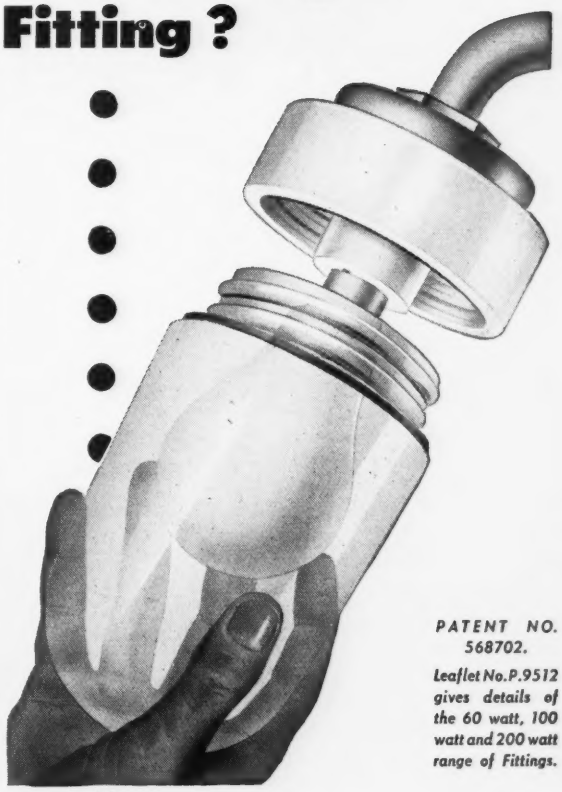

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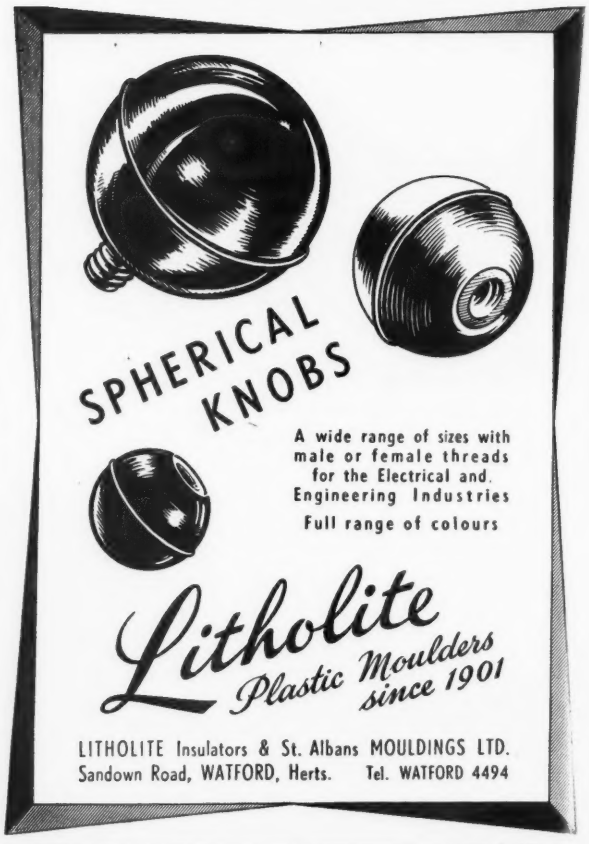
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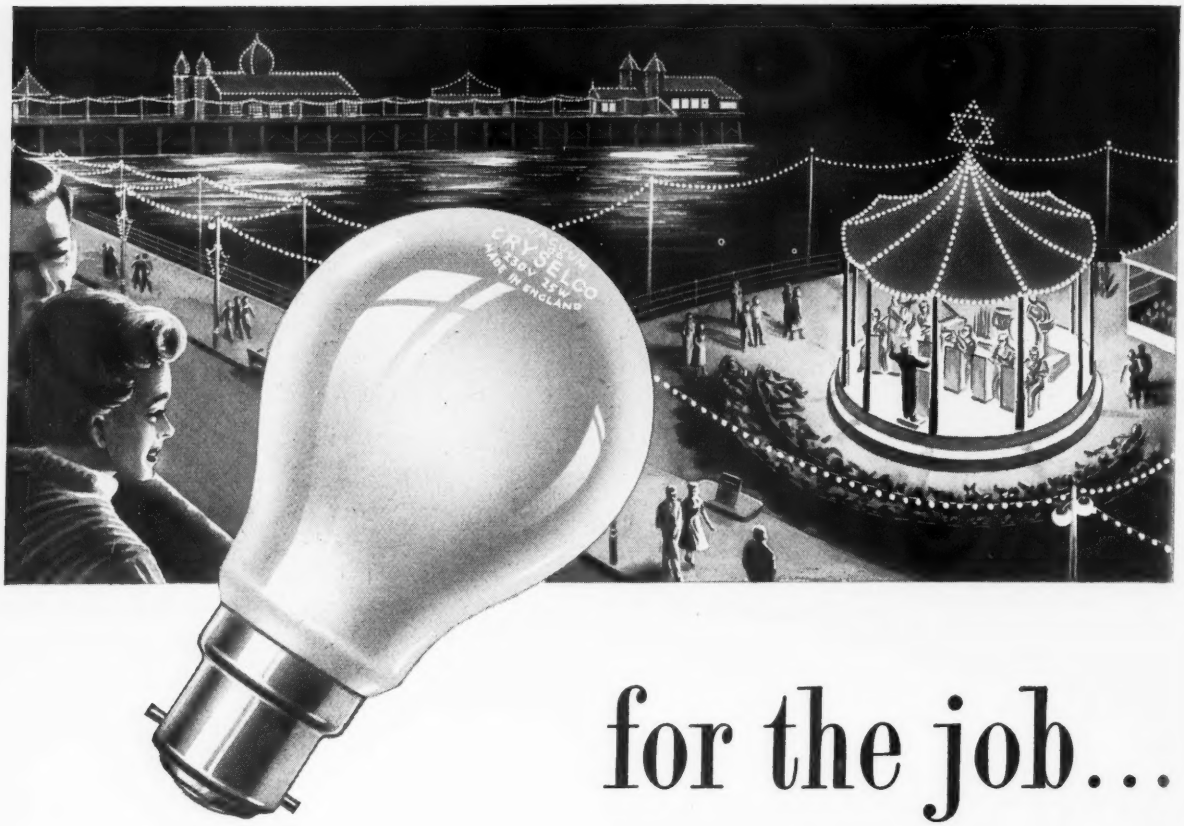

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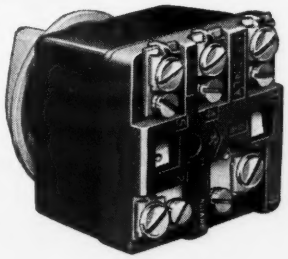
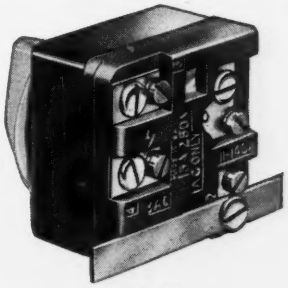


4 AC1
D.P. 3 heat ‖rear wiring 1¾" deep. Designed to conform with European specifications.



3 AC1
S.P. 3 heat 1.7/16" max. rear projection. Arranged for horizontal R.L. Bus-bar wiring.

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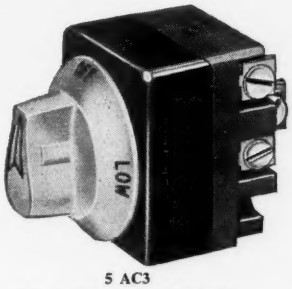
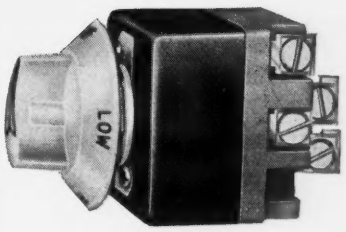


5 AC3
S.P. 3 heat for standard side wiring. Max. rear projection 2.1/16"



7 AC3
S.P. and D.P. 3 heat, rear projection interchangeable with existing Q.M.B. types.

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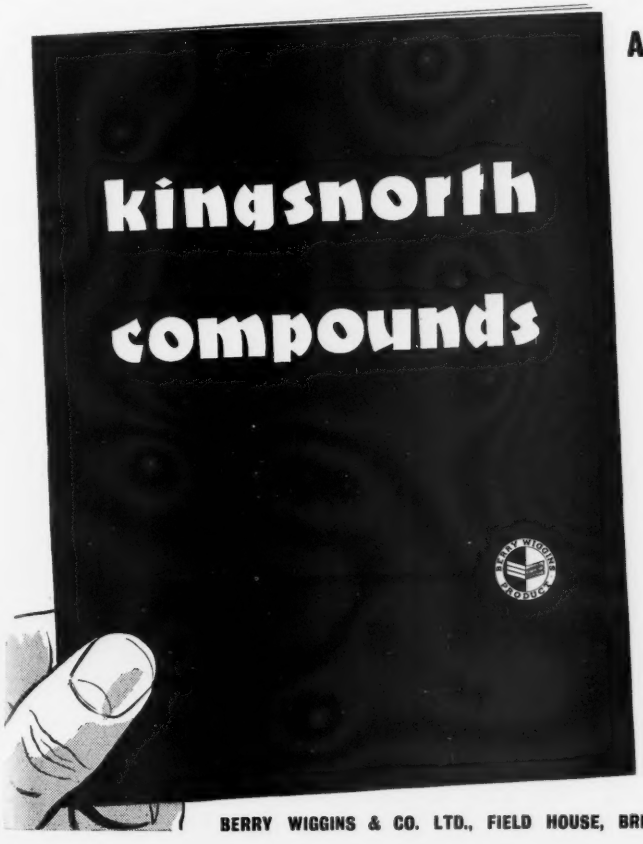

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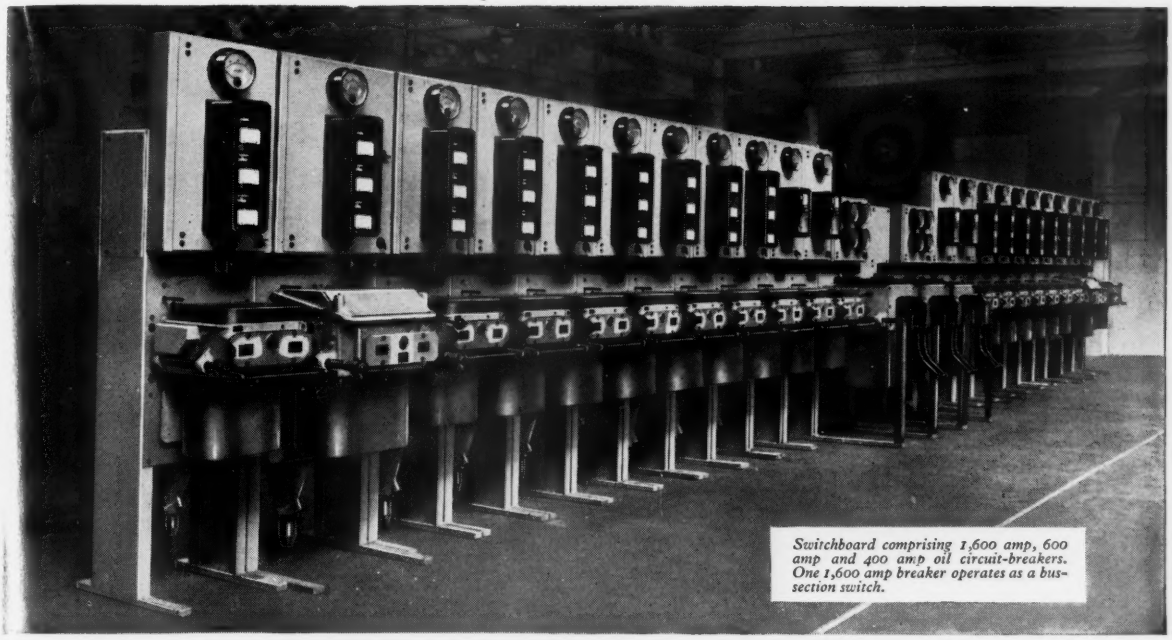

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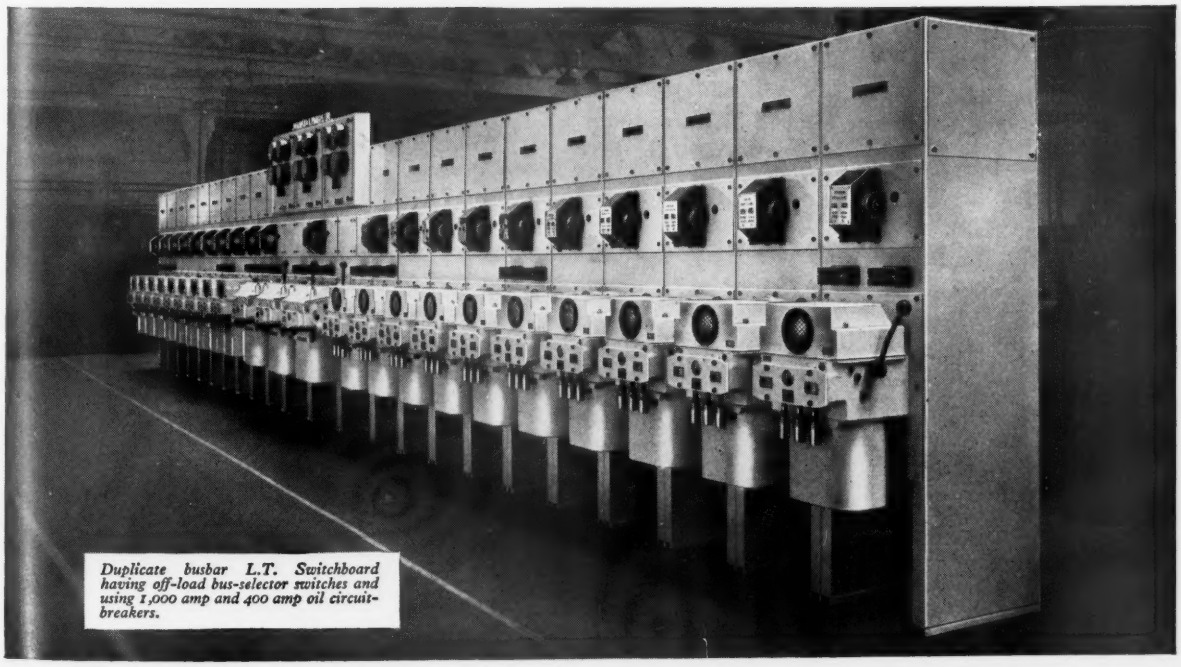

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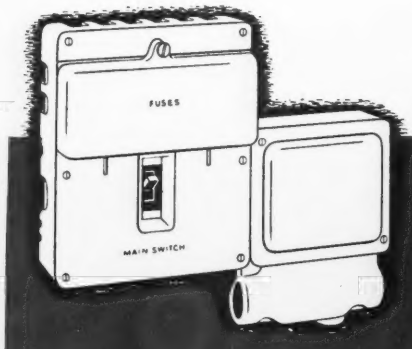

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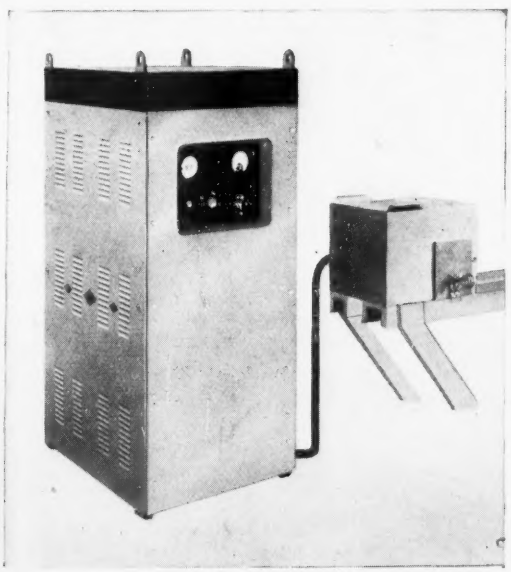

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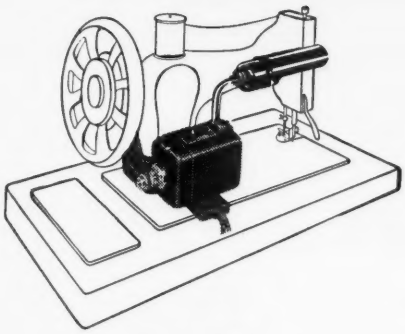

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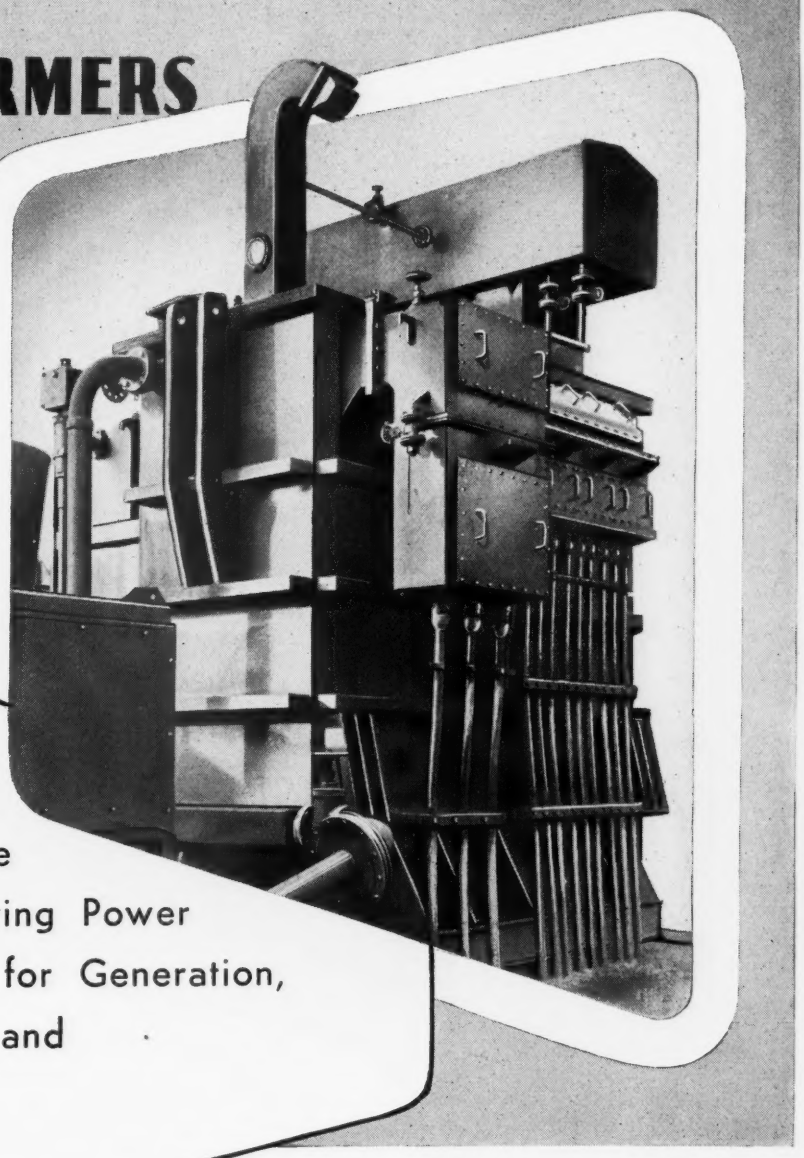

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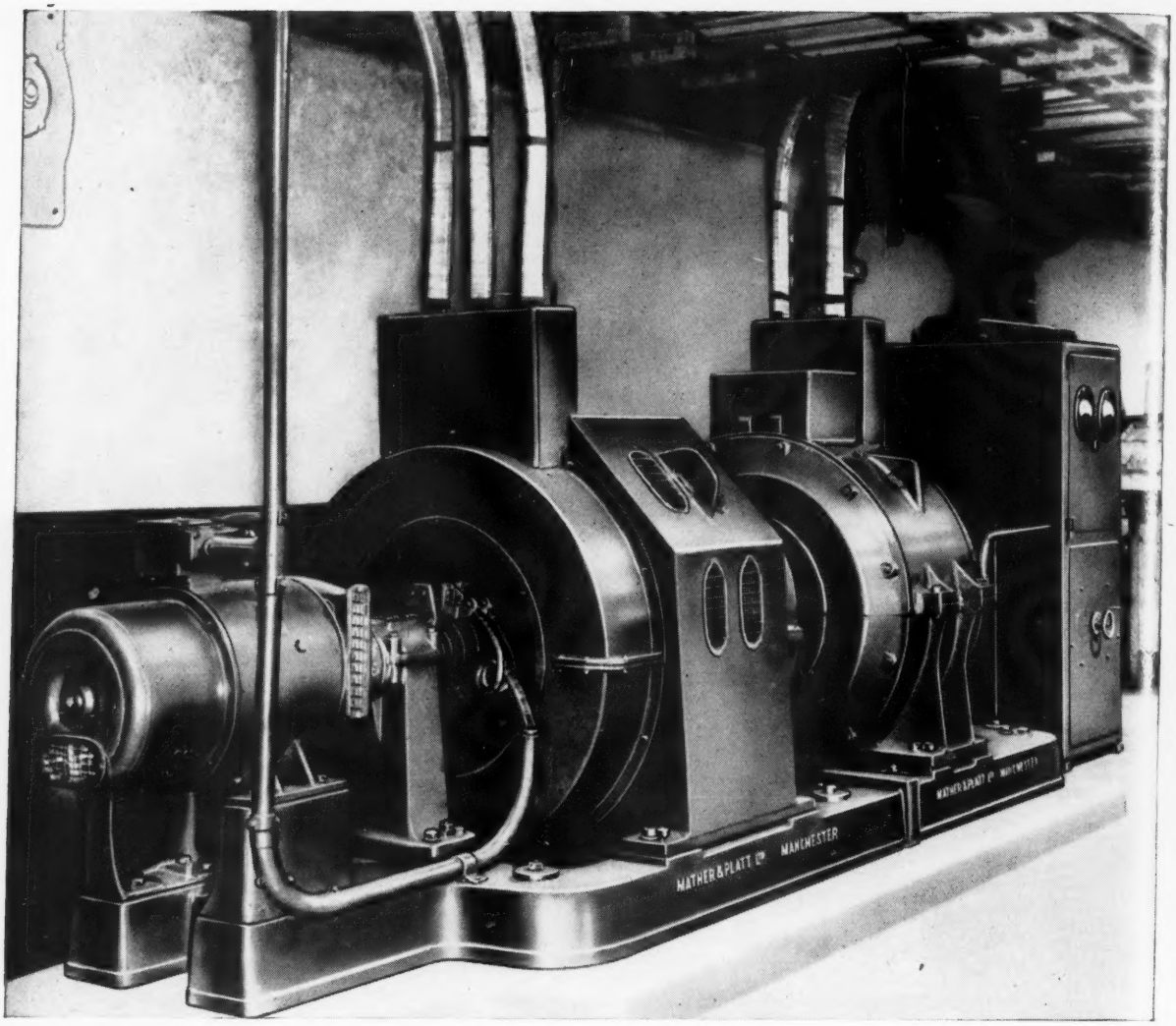

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The motor generator set illustrated is installed at a South of England paper mill. The motor is a direct-on started 435 h.p. synchronous machine, 400 v., 0·5 leading power factor, 1,000 r.p.m., starting current 2½ times full load current. The D.C. generator supplies 300 kW at 230 v.

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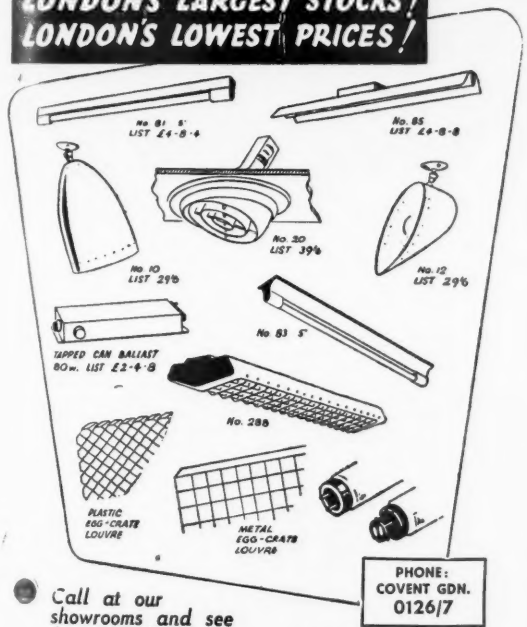

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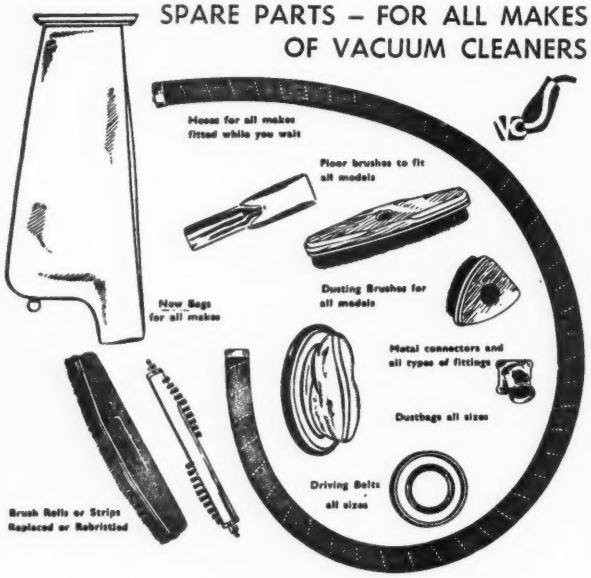
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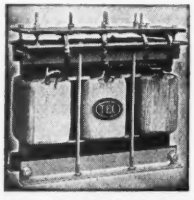

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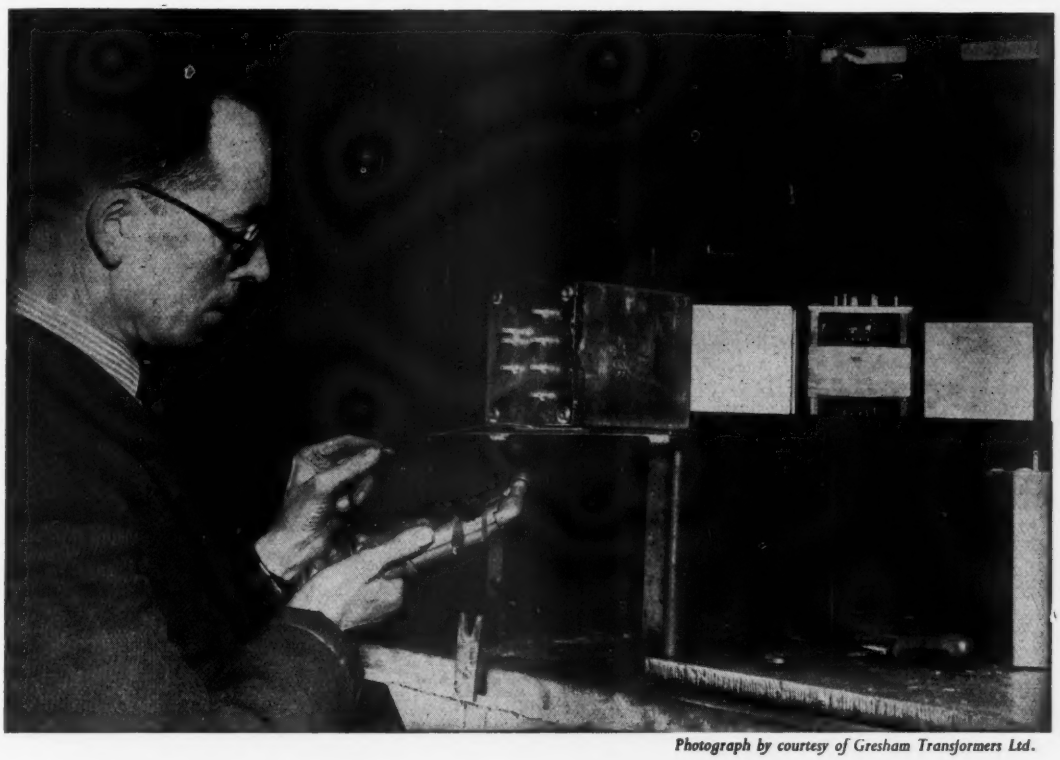

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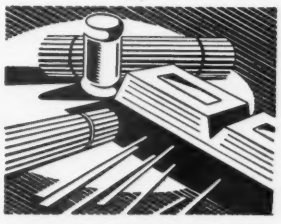

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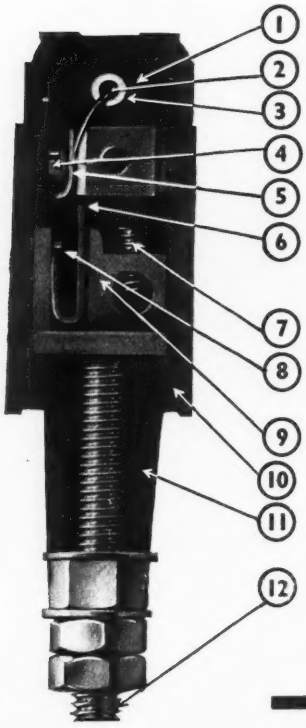

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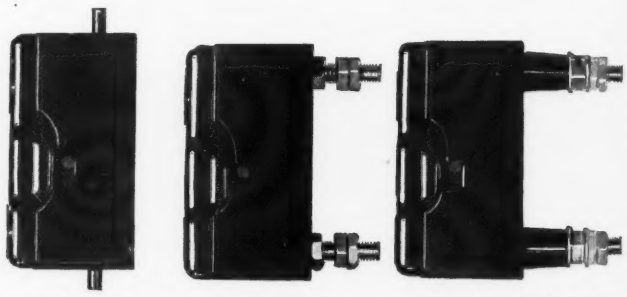

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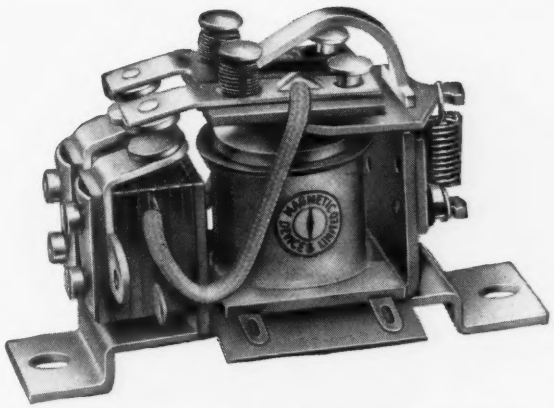

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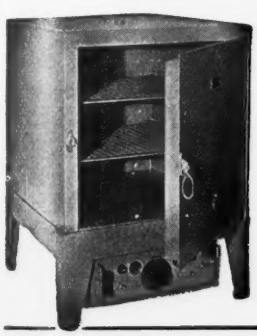

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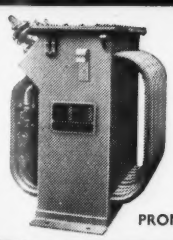

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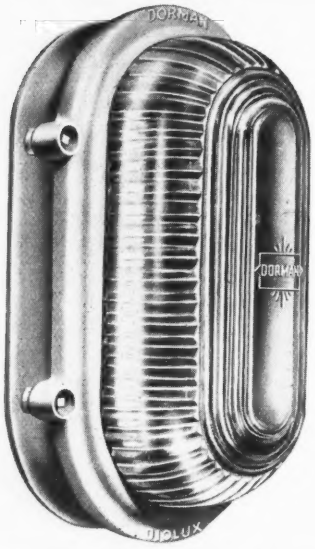

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WRITE FOR LEAFLET PSM 1254

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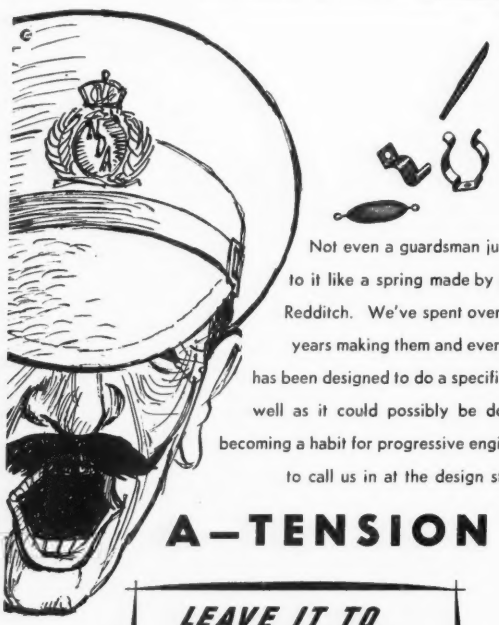
LIGHTING DIVISION - MANCHESTER 5 and at DORMAN HOUSE 10 EMERALD STREET LONDON, W.C.1 | 249 ST. VINCENT STREET GLASGOW, C.2 | 11 COLLEGE SQUARE NTH BELFAST



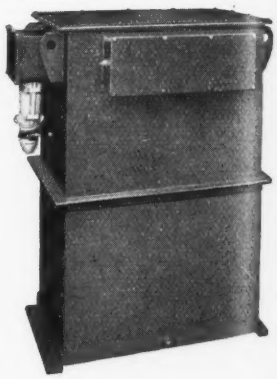
Not even a guardsman jumps to it like a spring made by Lewis of Redditch. We've spent over thirty years making them and every one has been designed to do a specific job as well as it could possibly be done. It's becoming a habit for progressive engineers to call us in at the design stage.

A—TENSION

LEAVE IT TO **Lewis** *OF REDDITCH*
SPRINGS, SPRING CLIPS
PRESSWORK, WIRE FORMS
VOLUTE SPRINGS

THE LEWIS SPRING CO. LTD., Resilient Works, REDDITCH
Telephone: REDDITCH 720/1/2
London Office: 321 High Holborn, W.C.1. Telephone 7479 & 7470

STURDY Transformers



Sturdy Transformers are manufactured for all industrial applications from 1 KVA to 100 KVA

Our technical service is at your disposal.
Illustrated Brochure describing our complete range is available on request.
ENQUIRIES INVITED

Regularly supplied to Government Departments, N.C.B., B.E.A. and many large industrial users.
EARLY DELIVERY

Sturdy ELECTRIC CO. LTD.
BURNOPFIELD NEWCASTLE UPON TYNE **Phone: Burnopfield 237**

Scott H.J.
OF NORTHERN IRELAND.

MOTORS & GENERATORS

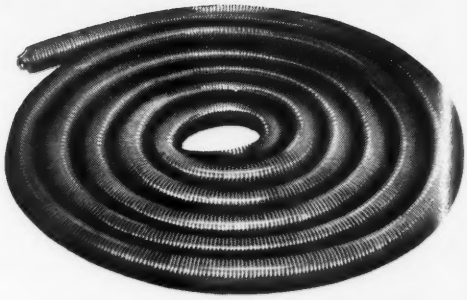
MANUFACTURERS OF

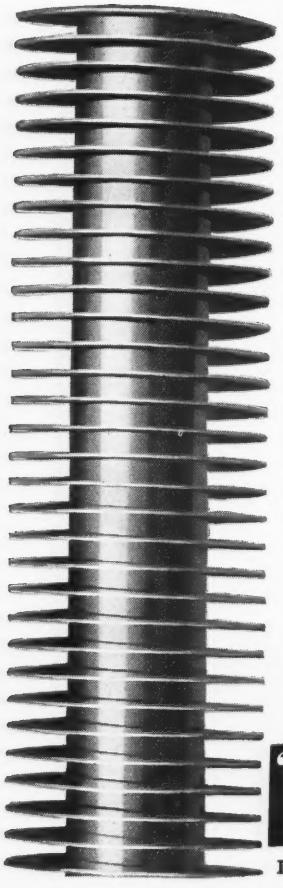
A.C. MOTORS ½-200 H.P.—D.C. MOTORS ½-200 H.P.—ALTERNATORS 1-125 KVA
GENERATORS ½-150 KW—GEARED MOTORS—MOTOR GENERATOR SETS
INVERTED ROTARY CONVERTERS

HUGH J. SCOTT & CO (BELFAST) LTD

VOLT WORKS, BELFAST, N. IRELAND

'INTEGRON' Integral finned tubing





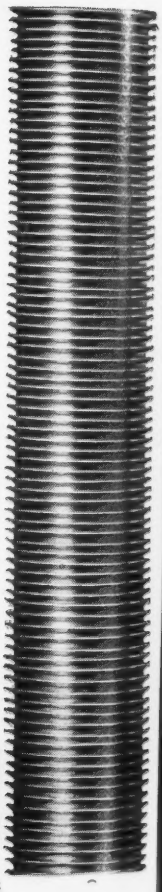
'INTEGRON' is a finned tube in which the fins are cold-formed from, and integral with, the parent tube. Made in copper, aluminium and certain alloys of these metals, 'Integron' tubing offers the advantages of strength, compactness, corrosion resistance and good heat transfer properties.

'Integron' is supplied in two forms—high-fin and low-fin —and in a wide range of fin spacings and dimensions to meet various heat exchange requirements.

The fins are not affected by vibration, shock or sudden temperature change and the continuous smooth surface reduces possibility of dust accumulation. 'Integron' tubing is easily manipulated—can be bent to close radii.

For radiators, convection heaters, skirting-board heaters, feed heaters, hydrogen and air coolers for electricity generators, oil coolers, transformer and rectifier oil or water coolers, compressed-air coolers, diesel-oil coolers, motor-car heaters, chemical coolers, 'Arcton' coolers, evaporators and condensers, humidifiers, dehumidifiers—and many other heat exchange applications.

Literature available on request.



'INTEGRON' finned tubing

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

M.318

THE

NEW "MIDCOIL" variable output TRANSFORMER

WITH SUPERFINE VOLTAGE CONTROL AND

OUTPUTS UP TO 20 KVA

Example: 0–280 volts, variable from zero to full voltage in finely graded steps giving control throughout the range to within 0·12 volts at full load with extremely **GOOD REGULATION**

Of particular interest to **DESIGNERS** of test equipment and with many other **INDUSTRIAL USES,** such as electric furnaces, etc.

FULL DETAILS and **PRICES** on request.

Other types include **LOW VOLTAGE** auto transformers, **3 PHASE** and **PHASE CONVERSION** types, designed and produced to customers' specifications.

A.I.D. APPROVED

A Quality Product from

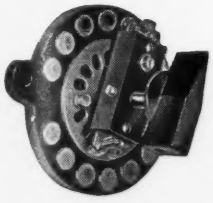
THE MIDLAND COIL WINDING COMPANY LTD.

4 LANCASTER STREET, BIRMINGHAM 4

PHONE: ASTON CROSS 1011 GRAMS: "MIDCOIL, BIRMINGHAM"

NEW!!

15-WAY ROTARY SWITCH



Adjustable from 1 to 15 way

THE SWITCH for Transformer Tapping Control

15 amp. – 30 amp.
S.P. – D.P. – T.P.

HENLEY, BURROWES & CO.

Kings Norton, Birmingham

LOCKS

Adaptable to Electrical and Mechanical Equipment to ensure correct sequence of operations for protecting both Personnel and Equipment. Padlocks – Special Locks, etc., for all industrial purposes. Locking and interlocking schemes developed and supplied.

CASTELL LOCKS LTD.
30 Woburn Place, London, W.C.1
Telephone: MUSeum 2063/4

1009

Beginning at the end

this is a Critchley thimble-type ferrule

— the most economical kind when using large quantities of similar marking. *Made for all sizes of cable. Brilliant permanent colours include red, white, blue, black, yellow and green.*

leaflet & samples on request

CRITCHLEY BROS. LTD., BRIMSCOMBE, STROUD

Telephone: BRIMSCOMBE 2208 GLOS

There's the widest possible range of...

. . . Berco Toroidal Wound Power Rheostats to suit every specification. Made in 5 sizes and of rugged construction to combine highest mechanical strength with maximum electrical performance, Bercostats are, if required, supplied with:—

*** 'Off' positions at either end of the winding.**

*** Rear extended spindles, or screwdriver slotted spindles. * Locking devices. * Tappings and graded windings. * Automatically operated toggle switches to open or close at either end of the winding.**

All models are vitreous enamel bonded and can be supplied with standard pressed steel covers for front of board mounting. Multi-gauged units with any combination of ohmic values are also available.

...BERCO *TOROIDAL RHEOSTATS*

Ask for List 613A, which gives full technical details and prices, from

THE BRITISH ELECTRIC RESISTANCE CO. LTD.,

Queensway, Ponders End, Middlesex. Phone: Howard 1492. Grams: Vitrohm, Enfield

Pioneers of the toroidally wound power rheostat in England

BERCO

BR 1951-AH

FIRST CLASS MACHINE TOOLS deserve

DONOVAN ELECTRIC CONTROL

Every quality-first, high-precision Machine Tool deserves the best and most reliable form of Control to ensure uninterrupted production, and to eliminate hold-ups or damage to expensive tools.

We are Specialists in the design and manufacture of high-quality electric control gear for Machine Tools including :—

LATHES, DRILLING MACHINES, PRESSES, GRINDING MACHINES, MILLING MACHINES, SAWING MACHINES, etc., etc.

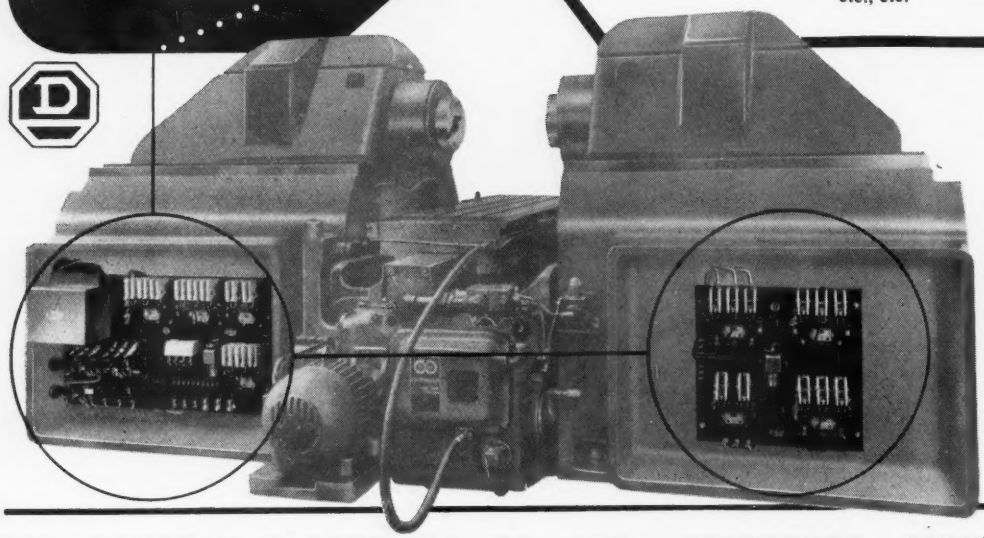
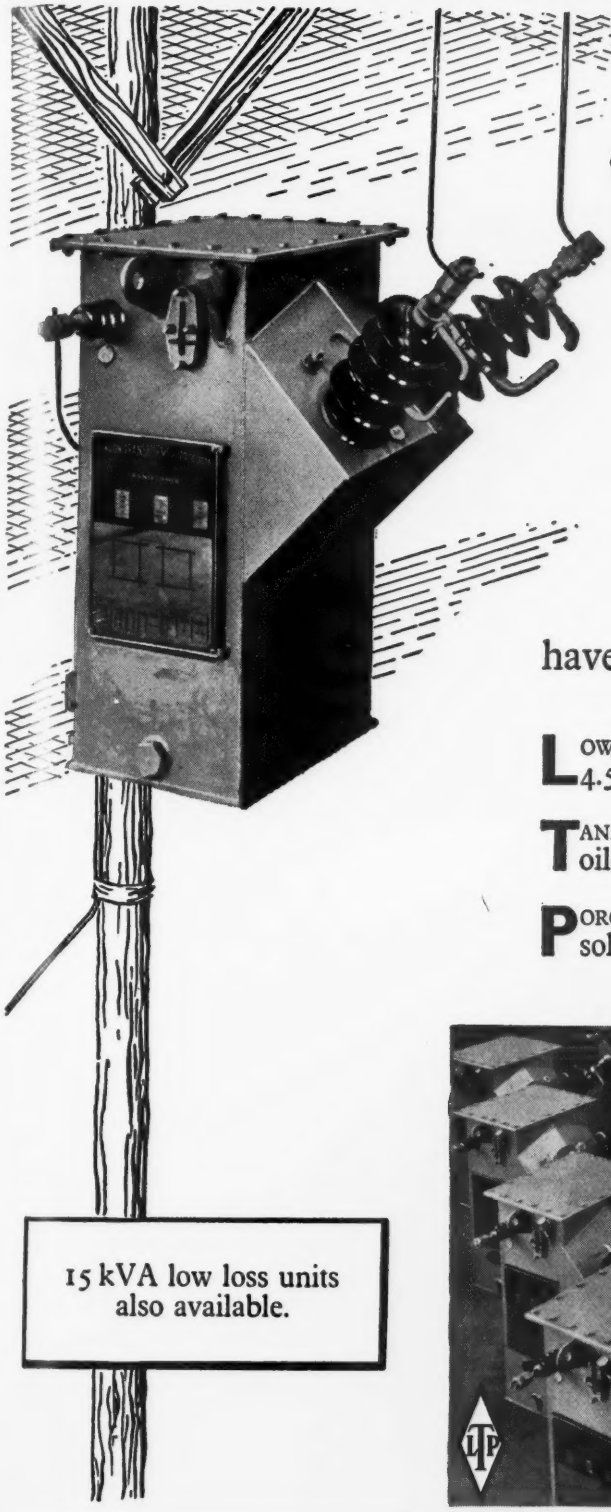


Photo by courtesy of Cincinnati Milling Machines Ltd.

***A CINCINNATI** Automatic Ram Type Miller controlled by Donovan Built-in Panels (with covers removed).*

THE DONOVAN ELECTRICAL CO. LTD., STECHFORD, BIRMINGHAM 33

Sales Engineers available in—LONDON, BIRMINGHAM, LEEDS, BELFAST, GLASGOW & BOURNEMOUTH



15 kVA low loss units also available.

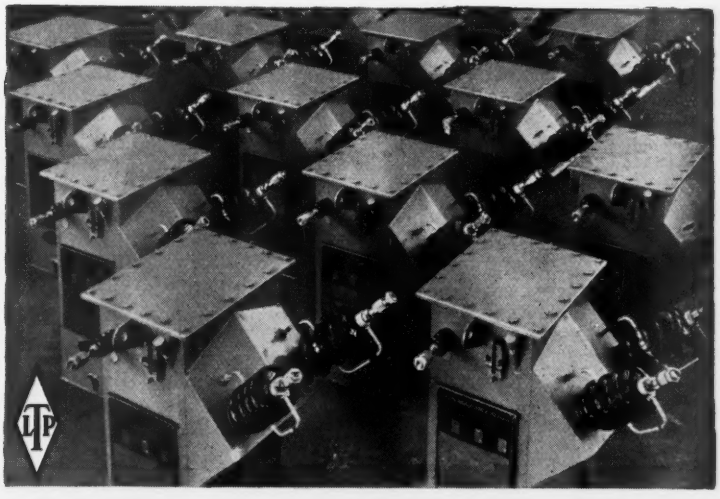
Transformers for Rural Distribution

have the following advantages –

LOW LOSSES and high overload capacities; 4.5 kVA normal rating; ratio 11,000/250V.

TANKS have single bolt fixing, domed cover, oil gauge and thermometer pocket.

PORCELAIN BUSHINGS easily replaced on site; solderless connectors and H.V. arcing horns.



LONDON TRANSFORMER PRODUCTS LTD.

Head Office: *Telephone: Willesden 6486*
COBBOLD ESTATE, LONDON, N.W.10.

Main Works: *Telephone: Bridgend 901*
GATE ROAD, TRADING ESTATE, BRIDGEND, GLAMORGAN.

GATHERING UP THE REINS!

GROUPED Motor Control is a contributory factor in realising the high production potential of modern continuous processes and sequence operations, for it provides a degree of co-ordination and synchronising unapproached by numerous separate controls.

It is indispensable where the interlocking of sequences is fundamental in a process or productive cycle as in paper, textile, steel and rubber mills, industrial refrigeration installations and mechanical handling and conveyor plants. It also has distinct advantages from the maintenance and space aspects.

Dewhurst will be pleased to advise on the application of this type of control or on electric control equipment generally, without obligation.

ER/19

DUPAR

DEWHURST

GROUPED MOTOR CONTROLS *for dependability*

DEWHURST & PARTNER LTD · INVERNESS WORKS · HOUNSLOW · MIDDLESEX

Telephone: HOUnslow 0083 (8 lines) *Telegrams:* Dewhurst, Hounslow

Branches: BIRMINGHAM · GLASGOW · LEEDS · MANCHESTER · NEWCASTLE · NOTTINGHAM

TAKE ONE!

Take one from this packet and be sure of a first-rate brand

WITH APOLOGIES TO Player's

See the A.S.C.M. Symbol on every length

The quality of Steel Conduit in any Electrical Installation is a vital factor in ensuring long life and satisfactory service. By specifying A.S.C.M. Conduit you take the first step to safeguard the reputation of all concerned in the provision of your Electrical Services.

A.S.C.M. MEMBERS ARE AS FOLLOWS

ALMA & CRANMORE TUBE CO. LTD.
BARLOW, H. J. & CO. LTD.
ELECTRICAL CONDUITS LTD.
GENERAL ELECTRIC CO. LTD.
GRIFFITHS, ISAAC & SONS
HILDICK & HILDICK
McDOUGALL, JAMES LTD.
METALLIC SEAMLESS TUBE CO. LTD.
MONMORE CONDUITS LTD.
SIMPLEX ELECTRIC CO. LTD.
Comprising :
Credenda Conduits Co. Ltd.
Perfecta Tube Co. Ltd.
Simplex Conduits Ltd.
Stella Conduits Co. Ltd.
STEEL TUBE & CONDUIT CO. (Middlesbrough) LTD.
TALBOT-STEAD TUBE CO. LTD.
WALSALL CONDUITS LTD.

ASSOCIATION OF STEEL CONDUIT MANUFACTURERS
96, HAGLEY ROAD · BIRMINGHAM 16

For all industrial distribution problems consult the G.E.C. whose technical staff are always available to draw up specifications to meet individual requirements. Write for a copy of publication C.1877 (G.E.C. Industrial Metalclad Distribution Systems).

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF NEWARK-ON-TRENT

Group "B" Street Lighting

TENDERS invited for the following work in connection with the provision of Group B Lighting on certain roads in the Borough.

Section 1. Bowbridge Road and Boundary Road. The supply, delivery, erection and wiring of 44 concrete lighting columns with mounting height of 15 ft. and 44 150-watt Tungsten lanterns.

Section 2. Sherwood Avenue and Beacon Hill Road. The erection and wiring of 26 Stanton type 7a columns and 26 lanterns "Metrovick SS. 51" and the supply and fixing of 26 150-watt Tungsten lamps.

Conditions of contract, specification and forms of tender may be obtained, and plans inspected, on application to the Borough Surveyor, Municipal Buildings, Newark, on payment of a deposit of two guineas, which will be refunded on receipt of a bona fide tender.

In tendering separate prices must be given for sections 1 and 2 of the contract and the Council reserve the right to accept one or both of these.

Tenders in plain sealed envelopes endorsed "Group B Lighting" to be delivered to me by 23rd September.

The Council does not undertake to accept the lowest or any tender.

J. H. M. GREAVES,
Town Clerk.

Newark-on-Trent.
24th August, 1954. 4870

BOROUGH OF BACUP

Street Lighting Installation, Tunstead Road Housing Site

TENDERS are invited for the provision of street lighting on the above-mentioned site. The work consists of supplying and laying approximately 1,000 lineal yards of .0225 sq. in. twin core cable; providing, erecting and putting into service 27 concrete lighting columns; and ancillary works. The General Conditions of Contract (A) recommended by the Institution of Electrical Engineers will apply.

Drawings may be inspected, and copies of the specification and form of tender obtained, at the office of Street Lighting Superintendent, Irwell Terrace, Bacup.

Tenders, in sealed envelopes endorsed "Tender, Street Lighting," and not bearing any name or mark indicating the sender, to be delivered to the undersigned by 9 a.m. on Wednesday, 22nd September, 1954.

The Council do not bind themselves to accept the lowest or any tender.

E. HUTCHINSON,
Town Clerk.

Town Clerk's Office,
Stubbylee Hall,
Bacup. 4872

CITY OF ST. ALBANS

London Road and Chequer Street

Group A Lighting

TENDERS are invited for the supply, erection and fixing of equipment for 110 S.V. Street Lighting installations. There are 93 concrete and 15 steel columns and brackets.

Documents are obtainable from the City Engineer and Surveyor, 16, St. Peter's Street, St. Albans.

Tenders in the envelopes provided, bearing no mark to indicate sender, must reach me not later than noon, Tuesday, 28th September, 1954.

W. B. MURGATROYD,
Town Clerk.

38, St. Peter's Street,
St. Albans. 4793

CITY OF BELFAST

Fluorescent Street Lighting Equipment

TENDERS are invited for the supply and delivery of fluorescent street lighting lanterns, brackets and concrete standards.

Form of tender and specification (No. W.46) may be obtained at the Electricity Department, East Bridge Street, Belfast, on payment of a deposit of two guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies may be obtained at one guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in sealed envelope marked "Tender for Fluorescent Street Lighting Equipment, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 24th September, 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
P.O. Box 234.
26th August, 1954. 4869

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

TENDERS are invited for the supply, erection and commissioning at Carolina Port Generating Station, Dundee, of the following:

One Steam Turbine-driven boiler feed pump and one Electrically-driven boiler feed pump for supplying two new 680 P.S.I. 150,000 lb./hour Steam Generating Units.

Tender documents and drawings may be obtained on application to the undersigned on payment of two guineas which will be refunded on receipt of a bona fide tender (which is not subsequently withdrawn) and the return of all documents.

Tenders should be delivered to the undersigned, together with all technical information required, in a sealed registered package marked "Confidential," not later than 12 noon on Monday, 22nd November, 1954.

The Board do not bind themselves to accept the lowest or any tender.

P. PHILIP, M.I.Mech.E., M.I.E.E.,
Area Manager.

7, Dudhope Crescent Road.
Dundee.
August, 1954. 4871

DURHAM COUNTY COUNCIL

Education Committee

THE Education Committee is prepared to receive sole tenders from electrical engineers for the following works:—

Dunston Hill County and Modern Schools: Electrical Installation.

Greatham C.E. (Cont.) School: Electrical Installation.

Applications for the forms of tender and specifications of work are to be sent to G. R. Clayton, Esq., F.R.I.B.A., County Architect, Court Lane, Durham, not later than the 11th September, 1954.

No pledge is given to accept the lowest or any tender.

J. K. HOPE,
Clerk of the County Council.

Shire Hall,
Durham.
24th August, 1954. 4836

BOROUGH OF THETFORD

Street Lighting, Thetford

TENDERS are invited for the supply and installation of 36 Concrete Street Lighting Columns, Group A standard, with sodium discharge lamps, lanterns and all auxiliary equipment in connection with the street lighting of the Trunk Road A.11 in Thetford.

Tenders may be submitted for supply of equipment only, installation only, or supply and installation.

The specification, bill of quantities and forms of tender may be obtained from the Borough Surveyor, Municipal Offices, Thetford, Norfolk, on payment of one guinea, which will be refunded upon receipt of a bona fide tender and return of all documents.

Plans and general conditions of contract may be inspected at the Municipal Offices, Thetford.

Tenders, in plain sealed envelopes, endorsed "Street Lighting, Trunk Road A.11," must be delivered to the undersigned not later than noon on 30th September, 1954.

W. ELLIS CLARKE,
Town Clerk.

Municipal Offices,
Thetford.
18th August, 1954. 4722

URBAN DISTRICT COUNCIL OF BILLERICAY

Public Lighting

TENDERS are invited for the provision and erection of 36 100-watt Tungsten lamps on concrete columns on Laindon (Pound Lane) Housing Site.

Application for tender documents must be made to the Surveyor to the Council by not later than 11th September, 1954.

The Council does not bind itself to accept the lowest or any tender.

A. HATT,
Clerk of the Council.

Council Offices,
Billericay,
Essex. 4873

COUNTY COUNCIL OF MIDDLESEX

Supplies Department

TENDERS are invited for the supply of Electric Lamps, for the period 1st November, 1954, to 31st October, 1955.

Applications with stamped addressed foolscap envelope for forms of tender and specification to Chief Supplies Officer, 245, Acton Lane, London, N.W.10.

Sealed tenders to be received by the 13th September.

The Council does not bind itself to accept the lowest or any tender.

CLIFFORD RADCLIFFE,
Clerk of the County Council.

Guildhall,
Westminster, S.W.1. 4792

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

132-kV Transmission Line

TENDERS are invited for the construction of a double circuit 132-kV Steel Tower Overhead Transmission Line from Clunie to Charleston, near Dundee.

Copies of the tender document may be obtained from the Engineers, Messrs. Kennedy & Donkin, 12, Caxton Street, London, S.W.1, on receipt of a deposit of £2 2s. (returnable).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16, Rothesay Terrace,
Edinburgh, 3. 4794

COUNTY BOROUGH OF READING

To Electrical Contractors

TENDERS are invited for the installation of electric wiring in 103 houses on the Corporation's housing estates. House and site plans, specification and form of tender can be obtained from the Borough Architect, Town Hall, Reading, at whose office the general conditions of contract may also be inspected.

Tenders to reach Town Clerk, Town Hall, Reading, by 10 a.m. Saturday, 25th September, 1954. No tender will be considered unless enclosed in the endorsed envelope provided bearing no indication of the sender.

The Corporation do not bind themselves to accept any tender. 4817

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

FIRST ASSISTANT CHEMIST, LONGFORD POWER STATION, COVENTRY (Vacancy No. 134/54/ER). Applicants should have had practical experience in all branches of power station chemistry. Preference will be given to candidates possessing Higher National Certificate in Chemistry or equivalent qualifications.

Salary for the above appointment will be within Class G, Grade 9 (£641-£667 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 15th September, 1954.

THIRD ASSISTANT ENGINEER, TESTING AND EFFICIENCY SECTION, DIV. H.Q. (Vacancy No. 135/54/ER). Applicants should have a good general and technical education to Higher National Certificate standard, workshop experience and a thorough knowledge and experience of operation and testing of modern steam generating plant, including instrumentation.

Salary will be within Schedule C, Class AX/DX, Grade 5 (£649-£858 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 15th September, 1954.

GENERAL ASSISTANT ENGINEER, TESTING AND EFFICIENCY SECTION, DIV. H.Q. (Vacancy No. 136/54/ER). Applicants should have a good general and technical education to Higher National Certificate standard, workshop experience and a good knowledge and experience of the operation and testing of modern steam generating plant, including instrumentation and automatic control systems, production of reports and records.

Salary will be within Schedule C, Class AX/DX, Grade 8 (£501-£694 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 15th September, 1954.

SECOND ASSISTANT ENGINEER, GENERTION (OPERATION)(Vacancy No. 137/54/ER). Applications are invited from suitably qualified engineers for the above position on the staff of the Generation Engineer (Operation) Northern Group, located at Nottingham.

Applicants should have served a recognised engineering apprenticeship and technical qualifications to at least Higher National Certificate standard are desirable. Experience subsequent to training must include power station operation and maintenance, preferably in a responsible position.

Salary will be in accordance with the National Joint Board Agreement, Schedule C, Class AX/DX, Grade 2 (£834-£1,053 per annum).

Closing date for receipt of applications, 15th September, 1954.

DRAUGHTSMAN, TRANSMISSION DEPARTMENT, DIVISIONAL HEADQUARTERS (Vacancy No. 140/54/ER). A draughtsman is required in the Transmission Department at this Divisional Headquarters. Experience on the design and construction of H.V. Sub-stations or overhead transmission lines an advantage.

Salary in accordance with Schedule D of the National Joint Board Agreement, Grade 6 (£433-£567 per annum) for Engineering Draughtsman or Grade 5 (£567-£671 per annum) for Senior Draughtsman, according to experience and ability.

Closing date for receipt of applications, 21st September, 1954.

GENERAL ASSISTANT ENGINEER, TECHNICAL DEPARTMENT, DIV. H.Q. (Vacancy No. 139/54/ER). The minimum technical qualification required is the Higher National Certificate in Electrical Engineering. Preference will be given to candidates who have completed a recognised post graduate apprenticeship, and experience of high-voltage switchgear and protective gear will be an advantage.

The successful candidate will be required to reside in or near Leicester.

The salary will be in accordance with Schedule C, Class AX/DX, Grade 8 (£501-£694 per annum) of the National Joint Board Agreement. The commencing salary will depend on qualifications and experience.

Closing date for receipt of applications, 21st September, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
27th August, 1954. Divisional Controller.
4888

HER MAJESTY'S COLONIAL SERVICE

Vacancy for Electrical Engineer, Public Works Department, Tanganyika

DUTIES are the design of general lighting and power installations. the supervision of the work to completion, and inspectional work under the Electricity Ordinance.

Appointment is pensionable on probation in the salary scale £655 to £1,320 p.a., point of entry depending on qualifications and experience. Temporary allowance of 35% of salary (maximum £350 per annum) and outfit allowance on salaries of £840 per annum or less are also payable.

Free sea passages are provided for the officer, his wife, and each child. The sea fare shall be limited to the air fare prevailing at that time. Government quarters are provided, if available, at a rental of 10% salary. Leave is granted at the rate of six days per month of resident service.

Candidates under 40 years of age, should have passed or be exempt from parts A and B of the examination for A.M.I.E.E., and have had at least two years' practical training.

Apply in writing, to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.112/8/015/D11. 4891

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule A of the Agreement:—

(a) SHIFT CHARGE ENGINEER at Hams Hall A Power Station, Grade J 7, commencing at £817 per annum (Vacancy No. 748MD).

(b) BOILER HOUSE SHIFT CHARGE ENGINEER at Nechells B Power Station, Grade J 9, commencing at £719 per annum (Vacancy No. 749MD).

Applicants for these positions should have received a sound technical training and power station practical experience in the operation and maintenance of steam generating plant and main switchgear. Applicants for (a) should also have a thorough knowledge of pulverised fuel firing. Appropriate qualifications an advantage.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 18th September, 1954. 4887

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS; PATENT EXAMINER AND PATENT OFFICER CLASSES

THE CIVIL SERVICE COMMISSIONERS invite applications for pensionable appointments. Applications may be accepted up to 31st December, 1954, but early application is advised as an earlier closing date may eventually be announced. Interview boards will sit at frequent intervals. The Scientific posts cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. In biological subjects the number of vacancies is small: individual vacancies exist at present for candidates who have specialised in palæobotany, foraminifera, malacology and lichenology. The Patent posts are in the Patent Office (Board of Trade) and Ministry of Supply.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification; or, for Scientific posts, possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' postgraduate or other approved experience. Candidates for Scientific Officer and Patent posts taking their degrees in 1954 may apply before the result of their degree examination is known.

Age limits: Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted. For Scientific Officers and Patent Classes, between 21 and 28 during 1954 (up to 31 for permanent members of the Experimental Officer class).

Salary (London): Senior Scientific Officers (men) £975-£1,150, (women) £845-£1,025; Scientific Officers (men) £470-£855, (women) £470-£750; Patent Examiner and Patent Officer Classes (men) £440-£760 (rates under review); women's rates somewhat lower. Somewhat lower rates in the Provinces.

Further particulars from the Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting No. S/53/54 for Senior Scientific Officers and S.52/54 or S.128/54 for the other posts.

NATIONAL GALLERY.

A vacancy exists in the laboratory for a SENIOR SCIENTIFIC OFFICER (CHEMIST). Duties involve the analysis and testing of materials used in the Conservation Department and assisting in the development of new techniques. An interest in chromatographic methods would be advantageous. Opportunities exist for research. The general qualifications and conditions are as set out in the main advertisement above. Candidates for this post should quote S.4363/53/54 and the closing date for applications is 23rd September, 1954. 4795

BRITISH INSULATED CALLENDER'S CABLES LTD.

invite applications for the following vacancies with their Telecommunications Laboratory at Kirkby, Near Liverpool.

(i) SECTION LEADER for a small team engaged on the development of accessories for paper and plastic insulated telecommunication cables. Candidates with some previous experience in this direction would be preferred.

(ii) Several PHYSICISTS or ELECTRICAL ENGINEERS for the development of: telecommunication cables and accessories, open wire transmission lines, measurement techniques, test gear and process control equipment, including servo systems.

(iii) MECHANICAL ENGINEERS for development work on telecommunication cable machinery.

(iv) MATHEMATICIAN of first rate ability for investigation of telecommunication transmission problems.

The vacancies call for candidates qualified to degree standard as appropriate, and in the case of item (iv) a first class degree is essential. Candidates qualified to H.N.C. standard and with some previous experience will be considered against (ii) and (iii). Opportunities for advancement are available and remuneration is at competitive levels.

Applications quoting reference P/45/54 should be submitted to the Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. 4776

YORKSHIRE ELECTRICITY BOARD

No. 6 (Hull) Sub-Area

SECOND ASSISTANT ENGINEER (Meters, Testing and Protection). Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, have a sound technical and practical knowledge of all types of metering, including instrument technology, and be capable of supervising the work carried out in a meter testing laboratory. Experience in the commissioning and maintenance of protective equipment will be an advantage.

Salary N.J.B. Class K, Grade 7, £869/£907 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 16th September, 1954.

No. 5 (Wakefield) Sub-Area

CASTLEFORD DISTRICT.

ASSISTANT INSTALLATION ENGINEER. Applicants must have had a sound technical education and practical experience in electrical contracting work of all types. They must be capable of preparing and supervising schemes for all classes of domestic, commercial and industrial installations, including specifications, estimates and tenders. Experience in electrical appliance repairs would be considered an advantage. Applicants must have had considerable experience in the control of workmen.

Salary N.J.B. Class F, Grade 10, £577/£598 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 16th September, 1954.

No. 7 (Grimsby) Sub-Area

SCUNTHORPE & GAINSBOROUGH DISTRICTS.

JUNIOR ENGINEER. Applicants should hold the Higher National Certificate in Electrical Engineering or an equivalent qualification. They should have had training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems.

Salary:—

Scunthorpe District: N.J.B. Class F, Grade 15/14, £402/£466 per annum.

Gainsborough District: N.J.B. Class D, Grade 15/14, £390/£423 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 16th September, 1954. 4837

SOUTH WALES ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER required in Districts 101/102 (Haverfordwest) in the Western Sub-Area.

Applicants should have experience in the construction, operation and maintenance of substations, underground and overhead, high and low voltage mains in urban and rural areas.

Salary, Class D, Grade 4 (£746/£765/£784) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 11th September, 1954.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. 4882

SOUTH WESTERN ELECTRICITY BOARD

FOREMAN LINESMAN, Central Construction Department, Taunton. Salary, £505 p.a., N.J.I.C. Agreement. 3 years' experience in overhead line construction including 1 year as chargehand and keeping of work records essential. Experience of underground cable laying helpful. Successful candidate required to work anywhere in South West, subsistence allowances payable away from Taunton.

Application forms obtainable from Mr. D. F. Horn, Central Construction Department, Priorswood Road, Taunton, should be returned by 14th September. 4881

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT of GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER (ASSISTANT SERVICE ENGINEER), BOLTON DISTRICT. Applicants must have had experience of all classes of electrical installation work and be capable of drawing up estimates of materials and labour costs; they should also have experience of the maintenance of domestic appliances. The possession of some qualification in electrical engineering or electrical installation work would be an advantage.

Salary scale £573/£596 p.a., Grade G.11, N.J.B. conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester, 3, by 11th September, 1954.

Appointment of SENIOR ASSISTANT ENGINEER (TESTING), SUB-AREA ENGINEER'S DEPARTMENT, OLDHAM. Applicants should be well qualified engineers with experience in the following: Administration and control of a large testing station including the calibration, testing and installation of all types of meters and associated equipment, testing of protective gear and the maintenance of telecommunication systems.

Salary £1,093/£1,141 p.a., Grade K.4, N.J.B. conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, by 11th September, 1954.

Appointment of SECOND ASSISTANT ENGINEER (SYSTEM PLANNING), SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, PRESTON. Applicants should be experienced in planning and estimating for extensions to overhead and underground systems, substation design and network calculations, for systems up to 33 kV, including some knowledge of protective equipment.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary scale £926/£966 p.a., Grade L.7, N.J.B. conditions.

Applications to the Sub-Area Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, by 11th September, 1954. 4821

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post: JUNIOR ENGINEER, NORWICH GENERATING STATION. Salary Class F/15, £402, to Class F/14, £466 per annum.

The duties of the successful applicant will include assisting in the control room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications, stating age, qualifications and experience, should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14, by 11th September, 1954.

W. N. C. CLINCH,
Controller. 4847

NORTH STAFFORDSHIRE TECHNICAL COLLEGE, STOKE-ON-TRENT

Principal: H. W. Webb, O.B.E., D.Sc.

APPLICATIONS are invited for the appointment of a full-time ASSISTANT LECTURER (GRADE B) in ELECTRICAL ENGINEERING. Candidates should preferably possess either a degree or a Higher National Certificate.

Salary according to the Burnham Technical Scale, which is now under review. The present salary is £490 × £25 to £765, with full allowances for training, graduate qualifications and industrial experience.

Applications, giving details of qualifications and experience, should be sent to the Principal immediately.

H. DIBDEN,
Clerk to the Governors. 4805

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies:—

THIRD ASSISTANT ENGINEER (COMMERCIAL), Chilterns Sub-Area Headquarters, Bedford (130/54.N.).

Candidates should have had a good general and technical education with experience in industrial and commercial power sales development. A competent knowledge of tariffs, thermal storage space heating and street lighting is essential. Membership of the Institution of Electrical Engineers will be an advantage.

Salary in accordance with Class L, Grade 10 of the National Joint Board Salary Agreement, commencing at £766.

Apply to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford.

Previously advertised in July, 1954 under reference number 100/54.N. Applications submitted then will automatically be reconsidered.

GENERAL ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT), Suffolk Sub-Area Headquarters, Finborough Hall, Stowmarket (129/54.N.).

Candidates should have had a sound technical training and some experience in planning and estimating for high voltage and low voltage distribution systems (including substations) up to 33 kV.

Salary in accordance with Class J, Grade 13 of the National Joint Board Salary Agreement, commencing at £552.

Apply to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk.

Future salaries and conditions of service for both these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. 4878

DESIGN ENGINEERS

THE ENGLISH ELECTRIC CO. LTD. invite applications for the following positions in their Mechanical Engineering Department at Luton:—

SENIOR DESIGN ENGINEERS. Age 28-35. Minimum qualifications H.N.C. standard with sound engineering training and experience. Applicants must be capable of initiating original designs, and some supervisory experience would be an advantage but not essential.

JUNIOR DESIGN ENGINEERS. Age 24-38. O.N.C. standard, to work in conjunction with Senior Engineers developing designs to a fully completed stage. A sound knowledge of workshop practice is desirable.

All positions require a thorough drawing office background in light/medium mechanical or electro-mechanical engineering. Successful applicants would be engaged on the original design of a wide variety of laboratory equipment, test rigs and specialised machines. Good salaries and conditions for the right men. Apply to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting ref. 1261A. 4341

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

GENERAL ASSISTANT ENGINEER required in the "Protective Gear and General Section" of the Technical Department at Divisional Headquarters, Portobello.

Applicants should possess qualifications leading to Associate Membership of the I.E.E. and have experience in the design, manufacture and commissioning of switchgear and protective gear. Knowledge of transformers and alternators an advantage.

Salary scale £501-£656 per annum (N.J.B. Class AX/BX/8). Placing according to experience. Pension scheme.

Apply in writing by 18th September, 1954, to Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity House, Portobello, Midlothian. 4886

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for post (a) and Corporate Membership for posts (b) an advantage.

(a) STATION SHIFT CONTROL ENGINEER, St. Marylebone Generating Station (Vacancy No. 54/714). Practical experience in control room operation necessary. Salary Class E, Grade 10 = £582 15s. p.a.

(b) MAINTENANCE ENGINEER (Mechanical), Woolwich Generating Station (Vacancy No. 54/715). Experience in the maintenance of modern generating plant is essential. Duties will include maintenance work covering mechanical plant in the boiler house, turbine house, coal handling plant, etc. Knowledge of negotiating and advisory machinery desirable. Salary Class G, Grade 6 = £826 7s. p.a.

(b) THIRD ASSISTANT ENGINEER (Generation Operation Dept.), Divisional Headquarters (Vacancy No. 54/716). Applicants should have a good technical education to the standard required for associate membership of the I.E.E. or I.Mech.E. together with some knowledge of power station operation and associated statistics. The successful candidate will be required to prepare concise reports on the salient features of power station operation and to investigate technical, economic and allied problems arising from power station operation. Salary Class AX/EX, Grade 5 = £681 9s./£927 3s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box No. 136, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. 4865

Amended Advertisement

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments:—

SENIOR DRAUGHTSMAN (MECHANICAL AND ELECTRICAL) (Vacancy No. 86). Salary Schedule D, Grade 5, £567-£671 per annum.

ENGINEERING DRAUGHTSMAN (MECHANICAL AND ELECTRICAL). Salary Schedule D, Grade 6, £433-£567 per annum.

Divisional Drawing Office, Construction Department.

Candidates should be suitably qualified and have had experience in one or more of the following:—

(1) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.

(2) H.P. and L.P. steam and feed pipework, condensing plant and feed heating systems.

(3) Conveyor plant, coal handling system and material handling of station auxiliary equipment.

(4) Preparation of layouts and diagrams of E.H.T. and L.T. switchgear, transformers and cables. Knowledge of protective gear systems advantageous.

Closing date for both appointments, 10th September, 1954.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff. 4759

BRITISH ELECTRICITY AUTHORITY

South Western Division

GENERATION ENGINEER (Operation) required, based at Plymouth. Candidates should preferably be Corporate members of one or more of the recognised engineering institutions and be familiar with the operation of modern H.P. plant.

Salary within N.J.M. Scale 5, £1,750-£1,900.

Applications, stating age, present position and salary, and giving full details of qualifications and experience, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 20th September, 1954. Quote ref. ER/515. 4820

CITY OF SALISBURY, SOUTHERN RHODESIA

Vacancy for Electrician

APPLICATIONS are invited from suitably qualified persons for the vacancy of ELECTRICIAN in the Test Department.

The successful applicant must be capable of carrying out all work on electrical street traffic control equipment, and experience in general electrical work in a test room will be considered an advantage.

The commencing rate will be determined with regard to qualifications and experience, but will not exceed 8s. per hour for a 48-hour week.

The successful candidate must be able to comply with the requirements of the Rhodesian Immigration Authorities, and will be required to submit a satisfactory medical certificate of fitness. Details of the Council's service and leave regulations will be forwarded on application.

Applicants are requested to submit full particulars of their qualifications, training and experience, giving details of positions held, marital state, age, place of birth and nationality. Copies of not more than three recent testimonials may be attached.

Canvassing, directly or indirectly, will be a disqualification.

Applications must reach the offices of the undersigned on or before Saturday, 18th September, 1954.

Airmail paper should be used.

DAVIS & SOPER LTD.,
Agents to the City
Council of Salisbury.

52 & 54, St. Mary Axe,
London, E.C.3.
25th August, 1954. 4695

ELECTRICITY AUTHORITY OF CYPRUS

Resident Electrical Engineer

APPLICATIONS are invited for the appointment of a RESIDENT ELECTRICAL ENGINEER to supervise the construction by contractors of extensions to the Authority's 66-kV and 11-kV transmission network.

Candidates should be Corporate Members of the Institution of Electrical Engineers or hold qualifications exempting them from the Institution examination, and must have had considerable experience in the construction of H.T. overhead lines up to 66,000 volts.

The appointment will be at a salary of £1,250 per annum plus a cost-of-living allowance the present level of which is 15%.

Free quarters with heavy furniture, or an allowance in lieu, will be provided by the Authority.

The appointment will be for a period of 3 years terminable by three months' notice on either side.

Free 1st class passages will be provided for the officer and his family up to three full passages, on first appointment, on termination of the agreement, and for long leave in the United Kingdom.

Home leave on full pay is earned at the rate of 2½ days per months of residence in service.

Applications, endorsed "Resident Electrical Engineer, Cyprus," stating age, qualifications and experience, should be forwarded within 14 days of the date of this advertisement to the undersigned, who will communicate with candidates selected for further consideration.

PREECE, CARDEW & RIDER,
8-12, Queen Anne's Gate,
Westminster, S.W.1. 4818

MIDDLESEX COUNTY COUNCIL

Education Committee

LABORATORY ASSISTANT required at HENDON TECHNICAL COLLEGE for Mechanical Engineering Laboratories. Experience in machine tools work or automobile engineering desirable. Opportunities for further study.

Salary Miscellaneous II (£380-£440 if 26 or over). Prescribed conditions.

Apply to Principal, Hendon Technical College, The Burroughs, Hendon, London, N.W.4, by 17th September (quote P.3.E.R.). Canvassing disqualifies. 4819

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment in the Transmission Department at Divisional Headquarters:—

SECOND ASSISTANT ENGINEER (CIVIL AND MECHANICAL). Salary N.J.B. Class AX/DX, Grade 2, £834-£1,053 per annum, plus London weighting.

Preference will be given to applicants who hold a University Degree in Engineering or who are Corporate Members of one of the Institutions of Civil, Electrical, Mechanical or Structural Engineers or who possess equivalent qualifications.

They should have had experience in the design and construction of overhead electrical power lines erected on steel towers, site works for electrical substations, foundations for heavy plant and brick buildings. They should also be familiar with the preparation and interpretation of specifications and bills of quantities and should have supervised contracts for the above works.

The commencing salary will depend upon experience and qualifications, but will be within the above range.

Forms of application may be obtained from the Authority's Headquarters or from any Divisional Office of the Authority, and should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northumet House, Southgate, London, N.14, by 18th September, 1954.

W. N. C. CLINCH,
Controller.
4880

FOREMAN ELECTRICIANS

TWO FOREMAN ELECTRICIANS required for service with the SUDAN LIGHT & POWER CO. LTD. in KHARTOUM, SUDAN, as Supervisors to plan and control the activities of a number of site foremen engaged on electrical installation work in buildings and to train Sudanese personnel.

Applicants must be of good general education and have served at least 5 years' indentured apprenticeship with a reputable firm of electrical engineers or contractors. They must have a thorough knowledge of power and lighting installations work and be fully experienced in the use of heavy gauge conduit and pyrotenax.

Salary in range £E.804 to £E.1,284 according to qualifications and experience. (£E.1 = £1 0s. 6d.)

Appointments will be on contract for a period up to 5 years, including a period of 12 months' probation, with a bonus payable on completion of the contractual period. A cost-of-living allowance will be payable in addition to salary. A kit allowance of £E.50 will be payable on appointment. Free living accommodation with basic furniture or an allowance in lieu thereof and free transport will be provided. After satisfactory completion of the probationary period liberal leave on full salary with free passages.

Applications, stating age, education, qualifications, experience, with particulars of posts held, present appointment and salary, with names of two references, should be submitted to the Secretary, The Power & Traction Finance Company Limited, Queens House, Kingsway, London, W.C.2. 4842

BRITISH INSULATED CALLENDER'S CABLES LIMITED

invite applications for the under-mentioned vacancies with their Telecommunications Engineering Department at Prescot.

TECHNICAL ASSISTANT for the preparation of technical recommendations and the evaluation of tenders, etc. A capacity for clear exposition is essential and the successful candidate must become familiar with a wide technical field which will require Higher National or Degree standard in Electrical Engineering.

TECHNICAL ASSISTANT to undergo training in telephone cable design and allied work which will involve considerable responsibility and judgment. Minimum qualifications, National Certificate or equivalent in Electrical Engineering.

Applications, quoting reference No. P/50/54, should be submitted in writing, to—The Staff Officer, Prescot, Lancs. 4890

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following posts:—

STATION CHEMIST, Earley Generating Station, Reading (S/13.560).

Applicants should be fully qualified industrial chemists with practical experience of fuel, water and oil testing. A knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage.

Salary N.J.B. G/7, £729-£758.

JUNIOR ENGINEERS (S/13.561).

Applicants should have had an apprenticeship or practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those waiting results of H.N.C. examinations).

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in the maintenance of electrical and mechanical generating plant or in generating station construction work.

Salary N.J.B. £402-£556, depending on qualifications, experience and position to which appointed.

Special application forms for each of the above posts obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 15th September, 1954. 4875

THE ELECTRICITY CORPORATION OF NIGERIA HAS VACANCIES FOR:—

(a) ELECTRICAL ENGINEERS,
(b) MECHANICAL ENGINEERS,

for service in Nigeria

Corporate Members of the INSTITUTIONS OF ELECTRICAL AND/OR MECHANICAL ENGINEERS are invited to apply. Applications for a limited number of vacancies will also be considered from men with good practical experience possessing the Higher National Certificate.

Commencing salaries range from £760 to £1,800 per annum according to qualifications, age and experience, plus generous expatriation allowance. Pensionable or contract terms are available, the latter carrying an increase in basic pay and a gratuity at termination of service.

Free passages are provided for man and wife with assisted passages or U.K. maintenance allowance for two children up to 18 years of age. Furnished quarters at low rental, free medical attention, low income tax, home leave on full pay.

Application forms can be obtained from the Liaison Officer, 11, Manchester Square, London, W.1. 4866

SOUTHERN ELECTRICITY BOARD

Installation Assistant

YEOVIL District, No. 4 (Bournemouth) Sub-Area. N.J.B. Class F, Grade 11, Column 1 (£548 per annum). N.J.B. conditions of service.

Applicants should have had sound experience in the preparation of specifications and estimates for all types of electrical wiring installations, and should be competent to supervise electricians and organise the allocation of work.

The successful candidate for the above appointment will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

Applications, on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, not later than 18th September, 1954. 4884

SOUTH EAST SCOTLAND ELECTRICITY BOARD

FARM SALES REPRESENTATIVE, Berwick District. N.J.C. Grade 2 (£485/£545 p.a.). Candidates should have experience in the applications of electricity in farm and garden, and general electrical and farming background knowledge.

Applications, stating age, qualifications and experience, should reach the Board at High Street, Galashiels, within 14 days. 4840

WORKSHOP SUPERVISOR (DIESEL-ELECTRIC & ELECTRICAL)

required by RAILWAY DEPARTMENT, GOLD COAST LOCAL CIVIL SERVICE, for one tour of 18/24 months. Consolidated salary in scale £990 rising to £1,230 a year. Gratuity at the rate of £100/£150 a year. Outfit allowance £60. Free passages. Liberal leave on full salary.

Candidates must have served an apprenticeship, preferably on heavy diesel-electric sets, and must have an adequate knowledge of alternators and D.C. motors. They must possess O.N.C. in Mechanical or Electrical Engineering, be able to read and understand drawings and electrical wiring diagrams, and have experience of maintenance in workshops where H.T. current is used. Experience of the running maintenance of diesel-electric sets is most desirable.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/40406/EF. 4838

BRITISH ELECTRICITY AUTHORITY

Headquarters, London

SENIOR ASSISTANT ENGINEER (Cooling Towers) required in the Generation Plant Design Sub-Branch. Duties will consist of investigations into the technical and economic aspects of cooling tower design, leading to the development of specifications and to critical assessment of the technical features and performance of specific designs.

Candidates should preferably hold an Honours Degree in Engineering and/or be Corporate Members of either the Inst.C.E. or I.Mech.E. Experience in either a civil engineering or cooling tower design office is desirable.

Salary N.J.B. Grade 1, £1,002 to £1,378 p.a. inclusive.

Applications, stating age, qualifications, experience, present position and salary, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 21st September, 1954. Quote ref. ER/512. 4845

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Design and Planning Branch of the North Western Sub-Area in Central London.

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £458 to £595 7s. per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 9th September, 1954. Please enclose addressed envelope and quote reference V/1804/R on envelope and all correspondence. 4804

STEWART TRANSFORMERS LTD.

manufacturers of transformers up to 250 kVA have the following vacancies available:—

TRANSFORMER FITTER
(Wiring and tanking).

TRANSFORMER WINDER.
ASSISTANT TESTER.

Applicants having the necessary experience may apply in person or in writing to:—

75, Kilburn Lane,
Kensal Rise, London, W.10. 4879

SOUTH EAST SCOTLAND ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (Planning), Southern Sub-Area Headquarters. N.J.B. G.10 (£608/£630 p.a.). Candidates (preferably qualified to H.N.C. standard) should have had sound practical training and experience in construction of rural and urban systems.

Applications, stating age, qualifications and experience, should reach the Board at High Street, Galashiels, within 14 days. 4841

MIDLANDS ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Industrial) required in the Sutton Coldfield and North East Birmingham District of the Birmingham and District Sub-Area.

Duties involve advising consumers on most suitable electrical equipment for their purpose and will include control of an industrial showroom. Experience necessary in applications of electricity for industrial uses. Technical qualifications desirable. Salary £764/£796 per annum (N.J.B. Grade J 8). Superannuable.

Applications within 14 days, stating age, qualifications, experience and present salary, endorsed "Second Assistant District Commercial Engineer," to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

A. STEPHENS,
Secretary. 4876

COUNTY BOROUGH OF BURNLEY

Education Committee

APPLICATIONS are invited for the following post:—

BURNLEY MUNICIPAL COLLEGE
GRADE "B" ASSISTANT in the Engineering Department to teach electrical subjects to Higher National Certificate level.

Burnham Technical Scale B, £525 × £25-£820 with allowances for appropriate experience and qualifications.

For forms of application apply, enclosing stamped addressed foolscap envelope, to the Director of Education, Education Offices, Burnley, by whom completed applications must be received not later than 10 days after the publication of this advertisement.

C. V. THORNLEY,
Town Clerk. 4880

BRITISH ELECTRICITY AUTHORITY

Headquarters, London

THIRD ASSISTANT ENGINEER (Boiler Plant) required in the Generation Plant Design Sub-Branch. Duties will be to assist in technical investigations in relation to boiler plant, with particular reference to combustion, heat transfer, circulation and stressing problems, and in the preparation of specifications.

Candidates should preferably have a degree in mechanical engineering or equivalent qualification, and experience in the manufacture of major items of power station mechanical plant, preferably those associated with boilers.

Salary N.J.B. Grade 4, £753-£981 per annum inclusive.

Forms from D. Moffat, Director of Establishments, Winsley Street, London, W.1, to be completed and returned by 20th September, 1954. Quote ref. ER/513. 4846

OPPORTUNITY FOR DRAUGHTSMEN

THE continued expansion of this company has created openings for a few draughtsmen to join us.

We offer good prospects in congenial surroundings for:—

ELECTRICAL DRAUGHTSMEN with experience in design of circuits and equipment.

Also DRAUGHTSMEN for our Layout and Engineering Departments.

Apply in writing to Personnel Manager, The Express Lift Co. Ltd. (controlled by the General Electric Co. Ltd.), Abbey Works, Northampton. 4653

SOUTH EAST SCOTLAND ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (Commercial), Southern Sub-Area Headquarters. N.J.B. G.7 (£729/£758 p.a.). Candidates (preferably qualified to H.N.C. standard) should have sound experience of electrical contracting, including preparation of specifications and tenders, and knowledge of I.E.E. and factory regulations.

Applications, stating age, qualifications and experience, should reach the Board at High Street, Galashiels, within 14 days. 4839

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of ASSISTANT SHIFT CHARGE ENGINEER at the Warrington Power Station. Salary £607/£629 per annum, Class F, Grade 9, N.J.B. Superannuable and subject to medical examination.

Applicants should preferably have qualifications leading to the Higher National Certificate in Electrical or Mechanical Engineering, and have a good general and technical education and be experienced in the shift operation of a modern power station.

Application forms from the Divisional Controller, Beaconsfield Road, Woolton, Liverpool. Closing date 9th September, 1954. 4843

BRITISH ELECTRICITY AUTHORITY

South Wales Division

(Vacancy No. 87/54)

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT ENGINEER (Combustion and Efficiency). Llynfi Power Station. Salary G 9, £641-£667 per annum.

Applicants should preferably have obtained H.N.C. and served a regular apprenticeship. Previous experience with large pulverised fuel boilers and Bailey automatic combustion control desirable.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road Gabalfa, Cardiff, to be returned by 17th September, 1954. 4874

LAURENCE, SCOTT & ELECTROMOTORS LTD.

Assistant Electrical Designers

TWO vacancies exist in the Design Department for young engineer having engineering degrees or equal in the design and application of variable speed A.C. machines and other special rotating electric machines.

Applicants should have completed or be exempt from National Service. Previous design experience would be an advantage. Good prospects of advancement exist for young men with ability and personality in the ever widening field of application of these machines. Attractive salary according to ability.

Write giving full particulars to the Secretary, Laurence, Scott & Electromotors Ltd., Gothic Works, Norwich, Norfolk. 4557

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER, Crawley District. Salary, £675-£701 p.a. under N.J.B., C.5. Superannuable. Applicants should be qualified and have experience in the construction, operation and maintenance of overhead and underground systems up to 33 kV. Duties will involve standby. (Applicants who replied to the previous advertisement for this appointment need not re-apply as their previous application will be considered.)

Applications, naming 2 referees, to F. A. Avery, A.I.E.E., District Manager, SEEBoard, 55, High St., Crawley, Sussex, by 15th September, 1954.

A. L. BURNELL,
Secretary.

August, 1954. 4883

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

ASSISTANT SECTION ENGINEER (Transmission) required for Edinburgh (Currie) Section.

Applicants must have had experience in maintenance of 132-kV transmission lines, cables and substation equipment, and possess qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary, £584-£745 (N.J.B. Class AX/BX/6). Pension scheme. No car allowance. Transport provided.

Apply in writing by 18th Sept., 1954, stating age, qualifications and experience, to Divisional Controller, British Electricity House, Portobello, Midlothian. 4885

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

(128/54.R.)

FITTER (ELECTRICAL), Hertford District. Candidates should be experienced in the erection and maintenance of switchgear up to 33 kV.

The rate of pay, at present 3s. 9d. per hour, for a 44-hour week, and conditions of service will be in accordance with the National Joint Industrial Council Agreement for the Electricity Supply Industry.

Applications by letter stating age, education and experience with details of present duties, should be submitted to the District Manager, Eastern Electricity Board, Northmet Sub-Area, Bridgefoot, Ware, Herts, within fourteen days of the appearance of this advertisement. 4877

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

APPLICATIONS are invited for the post of COMMERCIAL ASSISTANT operating from the Area Office, Dingwall, Ross-shire.

Applicants must have had experience in the preparation of estimates and should be familiar with all types of domestic electrical equipment and stores control. Must have initiative and be capable of sales promotion throughout a rural area.

Salary will be in accordance with N.J.C. Scale 2, £485 × £20 to £545 per annum.

Application form may be obtained from Area Manager, Church Street, Dingwall, Ross-shire, and should be returned within 14 days. 4822

A WELL-known firm of electrical component manufacturers require able young man to take charge of small assembly section. Some electrical knowledge and ability to control female staff is essential. Modern factory in Wandsworth (London). Write, giving full details of experience, age and salary required, to—Box 94.

ALKALINE BATTERIES Ltd., of Redditch, are the largest makers in the Empire of alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its technical sales and development sections for graduate electrical engineers, not over 30 years of age, or for men nearing the end of their degree course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed —Commercial Manager, Alkaline Batteries Ltd., Union Street, Redditch. 3936

AN old-established engineering company in the Birmingham area has a vacancy for a young man (age about 25/27) for training as a service engineer on their outside staff. National Service must have been completed. Apprenticeship and actual industrial experience in electrical or electronic work with emphasis on fault finding and testing of production equipment necessary. Very good prospects to successful candidate. Apply giving full details of experience, age and wages required to—Box 4823.

APPLICATIONS are invited by The English Electric Co. Ltd., Stafford, from electrical or mechanical engineers for interesting development work on control systems for hoists. Applicants should have served an apprenticeship, possess an engineering degree and preferably have experience of control gear or servo techniques as applied to heavy engineering. Permanent staff appointments; pension scheme; assistance with accommodation. Apply, quoting ref. 769C, to—Dept. C.P.S., 336/7, Strand, London, W.C.2. 4663

ASSISTANT chief engineer required by company engaged in the design and development of guided weapons. Candidates must be mechanical engineers with first-class qualifications and experience in electronics and light engineering. Knowledge and experience in servo-mechanisms essential since duties would include responsibility for missile control systems, electrical gyros, accelerometers, etc. Applicants should be 30-35 years of age and have sufficient personality and experience to administer and organise the development activity on these subjects. Write in detail, quoting reference G, to—Box AC.91032, Samson Clarks, 57/61, Mortimer Street, London, W.1. 123

ASSISTANT supervising and estimating engineer required for contracts department. Position offered has opportunity for taking control of a branch office. Apply in writing, giving full details of experience, age, salary required, to—Giles (E.E.) Ltd., 1a, Southampton Row, London, W.C.1. 4796

BOOTS PURE DRUG Co. Ltd. require an engineering draughtsman age 25-30. Salary £500/£600 per annum according to qualifications and experience. Superannuation scheme, 5-day week. Applications to—Personnel Manager, Station Street, Nottingham. 4729

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Company Ltd., 24, Fennel Street, Manchester, 4. The company requires additional electrical plant inspectors in one or two districts. Permanent positions carrying progressive salary scale £540 to £785 and non-contributory pension. Candidates, age 26 to 30 years, with apprenticeship in the manufacture or repair of electrical machinery, and preferably with subsequent experience of industrial use of electrical machinery, and who have gained the Higher National Certificate in Electrical Engineering or are Graduates of the Institution of Electrical Engineers, are invited to apply in own handwriting stating age, qualifications and experience. 4824

BRUSH ELECTRICAL ENGINEERING Co. Ltd., Loughborough, Leics., has a vacancy for a research engineer to assist with projects connected with high voltage technology and the development of power transformers. A good degree in electrical engineering or physics is necessary with experience of transformer design, manufacture, or associated techniques. Consideration will be given to candidates with suitable educational qualifications and experience of research in kindred fields who wish to develop further knowledge and experience in this important work. Existing facilities provide opportunities for original research. Please write with full details to the Chief Personnel Officer. 4867

BRUSH ELECTRICAL ENGINEERING Co. Ltd. has a vacancy in their general engineering division for a senior electrical or mechanical engineer who has had experience of either design, construction or operation of steam turbine or diesel-engined power systems, preferably overseas, and who can assist in the preparation and engineering of comprehensive power schemes. Applicants should be at least 28 years of age, and preference will be given to those with recognised professional qualifications. Applications with full details should be forwarded to—The Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 4727

COOKE & FERGUSON Limited, switchgear specialists, require sales engineers for engineering of schemes and preparation of tenders for indoor and outdoor switchgear. A knowledge of protection is essential, and applicants must be qualified in electrical engineering to at least H.N.C. standard. Salary commensurate with qualifications and experience. Please reply stating age, experience and qualifications to—Personnel Officer, Saxon Works, South St., Openshaw, Manchester, 11. 4806

CROMPTON PARKINSON Ltd. have vacancies for both senior and junior draughtsmen at their Chelmsford works. Preference will be given to applicants having contract, development or diagram experience on switchgear up to 11 kV, but adaptable men having good electrical and mechanical experience will be considered. Conditions of employment are ideal and prospects are good. Apply, giving fullest particulars to the Personnel Officer, Crompton Parkinson Ltd., Chelmsford, Essex. 4665

DESIGN draughtsman required with good drawing office experience, preferably on domestic electrical appliances. The post provides excellent scope for initiative and advancement. Applications, in confidence, to be addressed to—Mr. D. Hutton, British National Electrics Ltd., Newarthill, Nr. Motherwell, Scotland. 4798

DESIGN engineer required by progressive engineering firm having experience in the electrical design of F.H.P. motors. Salary according to age and experience. 5-day week. Pension and life assurance scheme. Please apply in writing, giving details of previous experience and salary required, to—Chief Engineer, Ranco Ltd., Newhouse Industrial Estate. 4894

DESIGN draughtsman required for M.V. and E.H.V. switchgear. H.N.C. or equivalent. Salary commensurate with qualifications. Pension scheme. Works in country situation, 20 miles from London. Accommodation can be arranged. Apply—Chief Engineer, J. G. Statter & Co. Ltd., Amersham Common, Bucks, marked "Confidential." 4666

DESIGN draughtsman. A vacancy exists in our design drawing office for a first-class designer draughtsman for interesting work associated with the development of automobile electrical equipment. He should be at least of H.N.C. standard and experience in the design of light electrical equipment for large quantity production would be an advantage. The post provides excellent scope for initiative and advancement. Reply stating qualifications, experience and age, to—Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham, quoting reference PM/D/93. 143

DESIGN draughtsman required, preferably aged 25-35, for work on light electrical mechanisms or instruments. H.N.C. preferred. Pension scheme, canteen. Write in tabulated form to—Personnel Manager, Dowty Equipment Ltd., Arle Court, Cheltenham. 4825

DESIGN engineer for power rectifiers is required by a large manufacturing organisation in the Midlands, for work of exceptional interest with good prospects. No previous rectifier experience is necessary, but candidates should have Degree or good H.N.C., and some practical training. Excellent residential and educational district. Please write with full details, to—Box No. 1321, T. & G., 167, High Holborn, London, W.C.1. 4779

DESIGNER required by small progressive company of electrical engineers East London for design and development of light electrical and mechanical apparatus and industrial resistance heating equipment. This is an opening leading to a top executive position. Applicants must be able to work on their own initiative and to control small drawing office. Write in strictest confidence, giving full details of past experience, age, qualifications and salary received for each of past 5 years, to—Box 4799.

DESIGNER required for work on medium and high-voltage power factor correction and furnace capacitors. Must have degree or H.N.C. or the equivalent in electrical engineering, and experience in the design and manufacture of medium/heavy electrical equipment. Good prospects. Write, giving full details of qualifications, age and salary required, to—The Technical Director, A. H. Hunt (Capacitors) Ltd., Bendon Valley, London, S.W.18. 71

DRAUGHTSMAN (electrical) required by West London firm for the layout of power and lighting installations and illumination schemes. Applicants should possess O.N.C. or equivalent and have served a recognised apprenticeship. Apply stating age, experience and salary required to—Box 4844.

DRAUGHTSMAN required by The General Electric Co. Ltd. at their head office in Kingsway for work on airfield electrification schemes. Applicants should be in the age group 25/30 years and have had a technical education up to O.N.C., preferably H.N.C., in electrical engineering. Apply in writing, quoting reference BD, to the Staff Manager, Magnet House, Kingsway, London, W.C.2. 4868

DRAUGHTSMAN required immediately for Ministry of Supply contracts. Must be used to instrument work. Ordinary National Certificate an advantage. Apply to—General Manager, Hendrey Relays Limited, 392, Bath Road, Slough, Bucks. 4811

DRAUGHTSMAN required for detail work on specifications necessary for manufacture of paper capacitors. Write or call—A. H. Hunt (Capacitors) Limited, Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18. 95

DRAUGHTSMAN required for design and detail work on electrical/mechanical apparatus. Should be at least of H.N.C. standard. Workshop experience essential. Apply in writing to—Personnel Manager, A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, London, S.W.18. 41

DRAUGHTSMAN required for development work on low-voltage control gear. Mechanical background is required with sound electrical experience. Pleasant country surroundings, 1 hour London. Good working conditions. Canteen. Housing assistance if required. Please write, giving age, qualifications, past experience, married/single, present salary, to—Box 4807.

ELECTRIC cable manufacturers, Manchester area, require an assistant in their testing and quality control dept. Knowledge of both rubber and plastic technology is absolutely essential. Permanent pensionable position. Apply giving full details of experience, salary, age, etc.—Box 4809.

ELECTRIC cable manufacturers, Manchester area, require an assistant foreman for their extruding dept. Knowledge of both rubber and plastic technology is absolutely essential. Permanent pensionable position. Apply giving full details of experience, salary, age, etc.—Box 4810

ELECTRICAL design engineer, age 25-30, required. University degree in electrical engineering desirable. Knowledge of rolling mill electrical equipment and experience with large electrical manufacturers essential. Applications, stating age, qualifications, experience and salary required, should be sent to—Personnel Officer, Davy and United Engineering Co. Ltd., Park Iron Works, Sheffield, 4. 4808

ELECTRICAL designer-draughtsman required having engineering degree or Higher National Certificate. Experience in design of high-voltage equipment an advantage. Salary according to experience and ability. Apply to—Chief Engineer, Pirelli-General Cable Works Ltd., Eastleigh, Hants. 4827

ELECTRICAL draughtsmen required by the Steel Company of Wales Limited (Steel Division), Port Talbot. Candidates should have experience in heavy industry and be capable of preparing drawings for electrical installation work, schematic diagrams, etc. A knowledge of lighting and communications would be an advantage. Higher National Certificate or equivalent desirable. Permanent and pensionable positions offered to suitable men with rates varying with age and qualifications. Those wishing to apply should send full particulars of age, qualifications, experience, etc., to the Personnel Superintendent, The Steel Company of Wales Limited, P.O. Box No. 3, Port Talbot, Glam. 4781

ELECTRICAL engineer required to take charge of engineering experimental department. Previous experience testing elec. motors essential. Minimum qualifications H.N.C. in Electrical Engineering. 5-day week. Pension and life assurance scheme. Please apply in writing to—Personnel Manager, Ranco Ltd., Newhouse Industrial Estate. 4895

ELECTRICAL engineer required as manager of old established firm of electrical contractors. Applicants should have a sound technical knowledge and be fully experienced in all aspects of contract procedure. Apply, giving fullest particulars in confidence, to—Managing Director, Doves (Darlington) Ltd., 24/26, Bondgate, Darlington. 7598

ELECTRICAL engineer required (aged 30-40, preferably chartered), to assume leading position, commanding equivalent £1,000 p.a. to start, in design office of London company. Applicants must be fully conversant with low and medium voltage automatic contactor gear, motors, relay systems, and methods of temperature control. Previous D.O. experience and a thorough knowledge of wiring systems applied to precision machinery is essential. Write in first instance—Personnel Manager, Molins Machine Co. Ltd., Evelyn Street, London, S.E.8. 4892

ELECTRICAL engineer required for British Guiana sugar estate. Applicants preferred after proper apprenticeship, with Higher National Certificate and subsequent experience. Post involves supervision all electrical equipment, including turbine engine and diesel-driven generators, capacity around 1,500 kW., also motors, wiring, lighting and installation and maintenance of present and future equipment, all under general direction Chief Engineer. Age 25 to 35 years, three-year contract, free housing, three months' salaried leave and return passages paid. Commencing salary £800 to £900 according experience.—Box 4849.

ELECTRICAL engineer required for South Africa. Age 27-30, preferably single. Good practical experience with Higher National Certificate, knowledge of lifts and cranes an advantage. Emoluments £750 to £1,000 p.a. according to age and circumstances. Write—Box R.337, c/o Streets, 110, Old Broad Street, London, E.C.2. 4826

ELECTRICAL wholesalers require experienced traveller for retail trade.—London Electrical Co., 92, Blackfriars Road, London, S.E.1. 4701

ELECTRICAL engineer with degree in electrical engineering or with a minimum qualification of H.N.C. in electrical engineering; knowledge of electronics or magnetic amplifiers preferable but not essential. National Service should have been completed. Salary in accordance with qualifications and experience. Apply—Labour Manager, Rolls-Royce Limited, Derby. 4828

ELECTRICAL research assistant. A large organisation in the North-West wishes to appoint a young man to evaluate the electrical properties of new insulation products. Possession of Higher National Certificate in Electrical Engineering is desirable. Apply to—Box 4800.

ELECTRICAL surveyor required by London insurance company for service in Newcastle. Age 26/30. Higher National Certificate and manufacturing experience of medium size motors. Knowledge of repair work and refrigeration an advantage. Salary £540 rising to £785. Non-contributory pension and other staff benefits.—Box 4850.

ELECTRICAL wholesalers, London (E.W.F.) invite applications from senior and junior representatives for North and North-West London area; also East London and Essex. Senior representatives must have established connection in the industry. Brief particulars in first instance, in strict confidence. (Own staff have been notified.)—Box 4801.

ELECTRICAL wiremen and mates required fully experienced in all types of installation work, M.O.W., exhibitions, etc.—Box 7600.

ELECTRONIC engineer required for research and application of electronics to vibration and stress problems. Young engineers with good academic qualifications and some experience of this type of work are invited to apply for this post. Excellent conditions include a non-contributory staff pension scheme and there are first-class prospects for the right man. Please apply with full details of qualifications, experience, etc., to the Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 4760

EXPERIENCED instrument panel wiremen required S.E. London. Good prospects.—Box 7559.

EXPERIENCED senior draughtsmen required by large engineering company in the City. Successful applicants will be paid in accordance with their ability, experience and desire to work. The company would like their draughtsmen to make a career of the drawing office and is willing to pay ample salaries to the right men to ensure they remain in our employ and do a reasonable day's work. No trouble makers need apply. Five-day week, pension scheme. Apply to Box 4829, giving full particulars of age, education and experience.

FOREMAN required for Paper Cable Department of Scottish Cables (South Africa) Limited, Pietermaritzburg, Natal. Applicants must possess first-class experience in all sections, be good disiplinarians and conversant with modern production methods and procedure. Permanent position with excellent prospects. Applications, stating age, experience, etc, to—Scottish Cables Limited, Renfrew, Scotland. 4851

FOREMAN winder to take control of repair shop. Apply—Priory Electric Service (Coventry) Ltd., 3, Lower Ford Street, Coventry. 4896

FULL-time representative required by leading manufacturers in switch and thermostat field for Northern Counties area. Contact with electricity boards and leading industrial organisations necessary. Reply with full details of experience aand remuneration expected to—Box 4672.

HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd., Walton-on-Thames, Surrey, require experienced engineers for their transformer and/or rectifier estimating departments. Applications to be made in writing giving full details. 4702

H.T. plumber cable jointers required for contract work, must be prepared to travel. London rates or above plus out allowance. Permanent employment.—Box 4854.

JOINTER, plumber cable, first class, required for service overseas (12 months) by large engineering firm. Write, stating age, experience, references.—Box 4897.

JUNIOR engineers required for cable installation contracts throughout Gt. Britain, must be prepared to travel, permanent employment, good conditions.—Box 4853.

JOSEPH LUCAS Ltd. have vacancies in their design drawing office for several first-class mechanical designers for work on small motors and switchgear. Applicants should be up to H.N.C. standard and it is desirable that they should have experience in designing for quantity production. The positions are permanent and pensionable and offer excellent opportunities to men possessing initiative and originality. Please reply, stating experience, qualifications and age, to — Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham. 142

JUNIOR and senior detail draughtsmen with shop experience and design knowledge for work on light steel structures in London. 5-day week. Pension fund. Apply in writing, stating age, experience, qualifications and salary required, to—Staff Officer, British Insulated Callender's Construction Company Ltd., P.O. Box No. 108, 30, Leicester Square, London, W.C.2. When replying to this advertisement please quote Ref. No. C/49/54. 4893

JUNIOR lighting engineer required to assist in the preparation of lighting layouts and estimates. Previous experience in similar position desirable. Reply, stating age and experience, to the Manager, Troughton & Young (Lighting) Ltd., 143, Knightsbridge, London, S.W.1. 4852

LAB. technician required to undertake design and construction of test gear and carry out measurements of electrical properties of semi-conductor materials. H.N.C. standard and some practical experience. Apply in writing to—Director, Research & Development Dept., General Radiological Ltd., 15/18, Clipstone Street, London, W.1. 7582

LABORATORY assistant required for plastic cable manufacturers, must be fully experienced in chemical and electrical test. Higher National or Inter. B.Sc. preferred. Write full details of age, experience, salary required, and when available, to—J. Day & Co. (Derby Works) Ltd., Harrow Manor Way, Abbey Wood, London, S.E.2. 4782

LAYOUT draughtsman required by consulting engineers for electrical layout work, including H.V. and L.V. outdoor substations, indoor switchgear and cable diagrams. Applicants should possess or should be studying for H.N.C. or equivalent. Salary in accordance with qualifications. Apply in writing, reference KJB/RFS, to—Messrs. Kennedy & Donkin, 12, Caxton St., Westminster, London, S.W.1. 4716

LEADING fluorescent fitting manufacturers have vacancies for well-connected representatives in (a) London, (b) Yorkshire. Excellent prospects to sell established lines on salary and commission basis. Applications giving details of past experience to—Secretary, Micramatic Ltd., Wootton Mount, Bournemouth. 4857

MAINTENANCE electrician for large factory near Greenford (Middx.), preferably having experience with D.C. motors and control gear. Permanent position. Write fully to—Box 4630.

MAJOR oil company requires one electrical engineering draughtsman for work in the Middle East. Age 25-30 years. Candidate should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualifications. An engineering apprenticeship is required which includes 3 years' practical experience in the shops followed by 3-5 years in the drawing office on electrical installations for process plants, workshops and/or factories. Overseas allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme. Write, stating age and full details of qualifications, quoting F.500, to—Box 1221, c/o 191, Gresham House, London, E.C.2. 4831

MARCONI'S WIRELESS TELEGRAPH Co. Ltd., Chelmsford, have a vacancy for a qualified electrical engineer to prepare specifications and acceptance tests, negotiate with manufacturers, and generally advise the company in all matters relating to rotating electrical machinery of all types up to 500 kVA. Please apply, giving full details and quoting ref. 2252, to — Dept. C.P.S., 336/7, Strand, London, W.C.2. 4732

MATHER & PLATT Ltd., Park Works, Newton Heath, Manchester, have vacancies for senior and junior electrical draughtsmen for work in connexion with electrical rotating machinery. Excellent working conditions and a non-contributory pension scheme in operation. Apply to — The Employment Manager. 4830

MANAGER required for contracts department, London area. Previous experience essential. Must be fully conversant with estimating, supervision of labour, materials and preparation of accounts to completion. Write giving full details, copies of testimonials, age, salary required.—Box 4797.

MANAGER required for well-established electrical contractors for their North-East Coast branch. Applicants must be experienced in handling contracts from the enquiry stage to final invoicing. Good opportunities.—Box 4673.

MATERIALS control. Young man with works and drawing office experience on small electro-mechanical apparatus required. To prepare schedules of materials and components from drawings, to urge these from suppliers, and to record and allocate deliveries for manufacture. Good conditions in new offices; five-day week. Apply to — General Manager, Hendrey Relays Limited, 392, Bath Road, Slough, Bucks. 4812

MERZ & McLELLAN, consulting engineers, invite applications for electrical engineers to supervise the testing and commissioning of alternators, transformers, switchgear, control equipment and protective gear in various parts of Great Britain. Applicants should hold an engineering degree and have undergone a student or apprentice course at the works of one of the major contractors for electrical plant and equipment. They should have obtained practical works experience and experience in site testing and commissioning equipment at all voltages up to and including 132 kilovolts. Salary according to age, qualifications and experience. Staff pension scheme. Apply stating age, education, training, qualifications, institution membership, experience and salary required, to—Merz & McLellan, Milburn, Esher, Surrey. 4735

QUALIFIED engineer (British), age 22-25, with degree or equivalent and workshop training, required by company (London district) whose activities will enable experience to be gained in high voltage insulation practice. Submit details to—Box 4855.

REPRESENTATIVE to cover S.E. Scotland Electricity Board and N. of Scotland Hydro-Electric Board area. Applicants should be resident on the territory, have good contacts with architects, wholesalers and contractors, and possess their own car. This is an interesting and worthwhile post for a man with right background. Write in confidence to—The Sales Manager, M.K. Electric Limited, Wakefield Street, London, N.18. 4898

SALES engineer is required for a senior position in the sales department of Brookhirst Switchgear Ltd., Chester, one of the companies in the Metal Industries Group. Experience in electrical control gear and O.N.C. essential. Higher technical qualifications desirable. Please reply stating age, qualifications and salary to—The Group Training & Personnel Officer, Metal Industries Ltd., Universal House, 60 Buckingham Palace Rd. London S.W.1. 4802

SALES engineer required by Mersey Cable Works Limited, Linacre Lane, Bootle, Liverpool, 20, for North East England. Applicants should be between 35/45 and will be required to reside in the Newcastle area. Previous experience in the electric cable industry is desirable preferably with rubber and thermoplastic cables. Salary will be in accordance with experience and qualifications and the appointment qualifies for the Tube Investments Pension Scheme. Applications in writing should be addressed to the Secretary. 4858

SENIOR lighting engineer required with wide general design experience to take control of the I.E. department of well-known fittings manufacturers and designers.—Box 4899.

SHIFT charge engineer for Electricity Supply Undertaking in Bagdad. Applications are invited from suitably qualified engineers, preferably between 25 and 35 years of age, who have had experience in the operation of a power station of at least 15,000 kW, with medium pressure boilers. Salary £1,000 to £1,200 per annum, plus high cost of living allowance. Free house with heavy furniture will be supplied or a monthly house allowance of £12 in lieu. Three year contract, renewable, with first class passage each way for successful applicant and family (if married). Three months' leave on full pay in U.K. on completion of 24 consecutive months in Iraq, first class leave passages being paid.—Box 4848.

SALES engineer required by well-known engineering and manufacturing organisation to sell its mine signalling and telephone products in the Northern and Scottish Divisions of the N.C.B. Must have practical knowledge of the industry and be prepared to reside in the Newcastle area. Salary, commission and expenses. Car provided. Please write to Box No. 108, giving full details of experience and qualifications.—Dorland Advertising Ltd., 18/20, Regent Street, London, S.W.1. 4785

SALES representative required for London area by well-established manufacturers of electrical wiring accessories. Sound connection with wholesalers and electricity boards essential. Good salary, etc. Excellent prospects for man of proved ability. Write fully, stating age, experience, etc.—Box 4859.

SAO PAULO LIGHT & POWER Company Limited, a British company in Brazil, invite applications from suitably qualified men for the position of shift charge engineer in the Piratininga Power Station. The power station, which has recently been completed and is presently commencing operation, is situated near Sao Paulo (pop. 2.5 millions; temperate climate; 2,200 ft. above sea level). The plant comprises initially 2 80-MW, 1,800-r.p.m. steam turbo-alternator units, each supplied at 850 p.s.i., 900° F., by one 850,000-lb./hr. oil-fired boiler. Applicants should have a sound technical knowledge and wide experience of the operation of modern turbines and boilers, preferably with oil or pulverised fuel firing; should also have an aptitude for supervision and the maintenance of harmonious labour relations. Good salary, three years' agreement subject to renewal, with first class passage both ways; four months' paid leave after three years' service. Written application should be made to—Mr. W. P. Kellett, Joint Manager, Canadian-Brazilian Services Ltd., 148, Leadenhall Street, London, E.C.3. 4832

SKILLED electricians required for Midlands and North-East Coast town. Used to conduit work and prepared to travel. Good prospects of advancement.—Box 4717.

SMALL old-established electrical business in Leeds area has an opening for a young man who is looking for advancement as a reward for his experience, knowledge and energy. Contracting, maintenance, motor repairs, etc. Applicant must be sound and reliable and like his work. Please give full details in confidence to—Box 7584.

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STOCK department manager required by light engineering company in North London. Executive who has ability and considerable experience in controlling large stores and office staff. Age 35-45. Good conditions of employment and prospects of advancement. Commencing salary £700 p.a. Apply giving full details of experience to—Box 4704.

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SUPERVISING and estimating engineer with commercial and industrial installation experience required for the Leeds branch of Edmundsons Electric Co. Ltd. Reply by letter in first instance, to 28, York Place, Leeds, 1, marked for attention of the manager, and setting out qualifications and experience. 4900

SWITCHGEAR representative required for London and South, technically qualified to engineer and estimate low-tension contracts. Good prospects for young energetic man with ability and personality. Apply in confidence to—Box 7568.

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THE NATIONAL BOILER AND GENERAL INSURANCE Co. Ltd., St. Mary's Parsonage, Manchester, 3, requires engineers for appointment as inspecting engineers of (a) boilers and engines and (b) electrical plant. First-class M.O.T. Certificate of Competency, and/or Higher National Certificate (mechanical or electrical), full apprenticeship and practical experience necessary. Apply in own handwriting, giving age (limits 26 to 33), training and experience, academic qualifications, and copies of testimonials. Salary £540-£785 (progressive). Non-contributory pension scheme. 4739

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Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

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A SALES engineer, 40, Assoc.I.E.E., car owner, with wide experience U.K. and Africa is available immediately. The position sought should offer progressive reward for proved ability to sell, branch-build, administrate and take responsibility, and be based preferably in S. or W. England.—Box 7596.

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FOR SALE

COUNTY BOROUGH OF SOUTHEND-ON-SEA

Redundant Generator Set

OFFERS are invited for the following redundant Steam Generator Set, now lying at Prittlewell Sewage Works, Southend-on-Sea. Purchaser to dismantle and remove to the satisfaction of the Borough Engineer.

BELLISS & MORCOM Compound Condensing Steam Engine, 300 h.p., direct coupled to CROMPTON PARKINSON 250-kVA Alternator, on common bedplate. Erected 1939. Complete with alternator panel.

LEDWARD & BECKET Surface Condenser, G. & J. WEIR Air Pump No. B.19364, and approx. 150 feet of 5" steam piping with expansion bed and 90° bends; all to suit the above.

The set became redundant in 1952 and as far as is known is still in good working order.

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Sealed tenders in envelope provided and addressed to the undersigned, and endorsed "Generator Set," but bearing no name indicating the sender, should be delivered to this office not later than 9 a.m. Tuesday, 12th October, 1954.

The Council do not bind themselves to accept the highest or any tender.

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Town Clerk. 4814

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2,000	G.E.C.	,,
1,600	STATTER	,,
1,500	ELLISON	,,
1,000	STATTER	Floor mounting
600	E.E.C.	,, ,,
500	STATTER	,, ,,
500	ELLISON	,, ,,
400	MAVOR & COULSON	,, ,,
300	YORKS. SWITCHGEAR	Wall mounting
300	ELLISON	,, ,,
300	ELLISON	Floor mounting
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FOR SALE

TURBO-ALTERNATOR, 4,000 kW, 6,600 volts, 3-phase, 50 cycles. Makers METROPOLITAN-VICKERS (1943), 10-stage Turbine and Condenser.

SWITCHGEAR (1949), comprising input and output panels with overload and earth protection, pressure and current transformers, directional relays, synchronising gear, instruments, cable boxes and neutral earthing resistor, etc.

TRANSFORMER (1949), 5,000 kVA, 6,600 volts / 11,000 volts.

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This equipment is offered as its stands for £25,000 OR A NEAR FIGURE and is considered to be in good condition, the buyer to be responsible for its removal. When purchased in 1949 it cost over £90,000.

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One 120-h.p. Compound Condensing Steam Engine; Four 230-volt D.C. Generators, 45 to 7.6 kW (convertible to motors); Eleven 230-volt D.C. Motors, 12 to 1½ h.p. with appropriate accessories. All in good running order.

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Halifax. 4901

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3,300 volts, 3-ph., 50 cycles

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A HIGH-vacuum impregnation unit or single or batch coil impregnation service to RIC Specification 214 or individual requirements.—Blickvac, Hamilton Road Works, Hamilton Rd., London, S.E.27 (Tel. Gipsy Hill 4394). 44

A.C. and D.C. house service meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one yr. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High Street, S.W.11 (Tel. Battersea 0780). 138

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. motors, all sizes, large stocks, fully guaranteed. — Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). 102

ALTERNATOR control panel cubicles, 1,000 kW, 500 kW, 250 kW, 150 kW, 3-phase, 440 volts.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 31

ALTERNATORS for sale. All sizes, voltages and frequencies up to 500 kVA. Exciters, automatic voltage regulators and switchboards available. For the most part unused and guaranteed for twelve months.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 4906

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ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 33

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DUBILIER 1952, 400-volt, 3-phase, 50-cycle, 5-kVAr power factor correction condenser. One D.I.C. ditto, 12.5 kVAr.—Whitefield Machinery & Plant Ltd., Cobden St., Salford, 6 (Tel. No. Pen. 4746/1373). 4834

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GENERATING sets, petrol and diesel-driven up to 30 kVA, new and reconditioned. Plants built to special requirements; consult us without obligation.—Powerco Ltd., Wandsworth Town Stn., York Rd., London, S.W.18 (VANdyke 5234). 150

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IMMEDIATE delivery new 330-kVA, 400-volt, 3-phase, 50-cycle, 4-wire B.T.H. alternator direct coupled to 400-h.p. Paxman diesel engine, 1,000 r.p.m., complete with switchboard and A.V.R. control.—C. J. Ferguson & Sons Ltd., 33, Barbican, London E.C.1 (Monarch 5474/5). 104

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PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

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TRANSFORMERS, new and secondhand, all voltages up to 10 kVA; also 50 kVA, 9,000/230/3/50, £95; 200 kVA, 400/200/3/50, £195.—Powerco Ltd., Wandsworth Town Station, York Rd., London, S.W.18 (VANdyke 5234). 152

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WELDING dynamos and welding sets for sale.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 11

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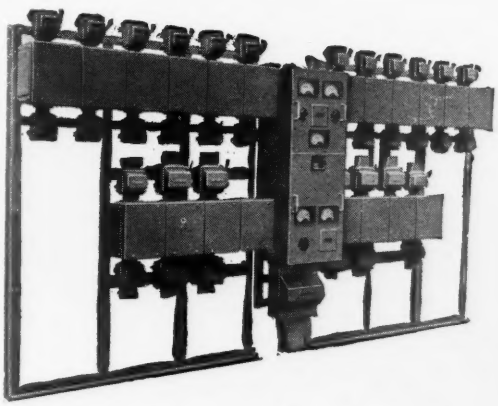

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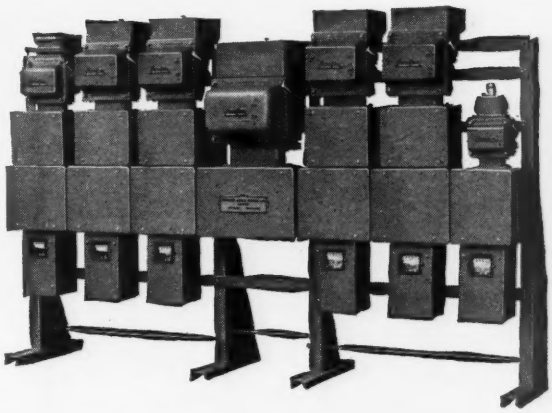

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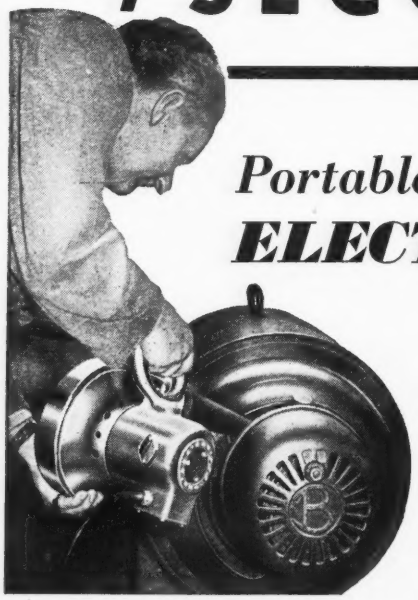

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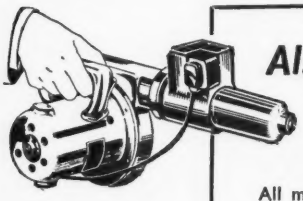

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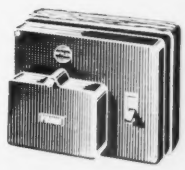

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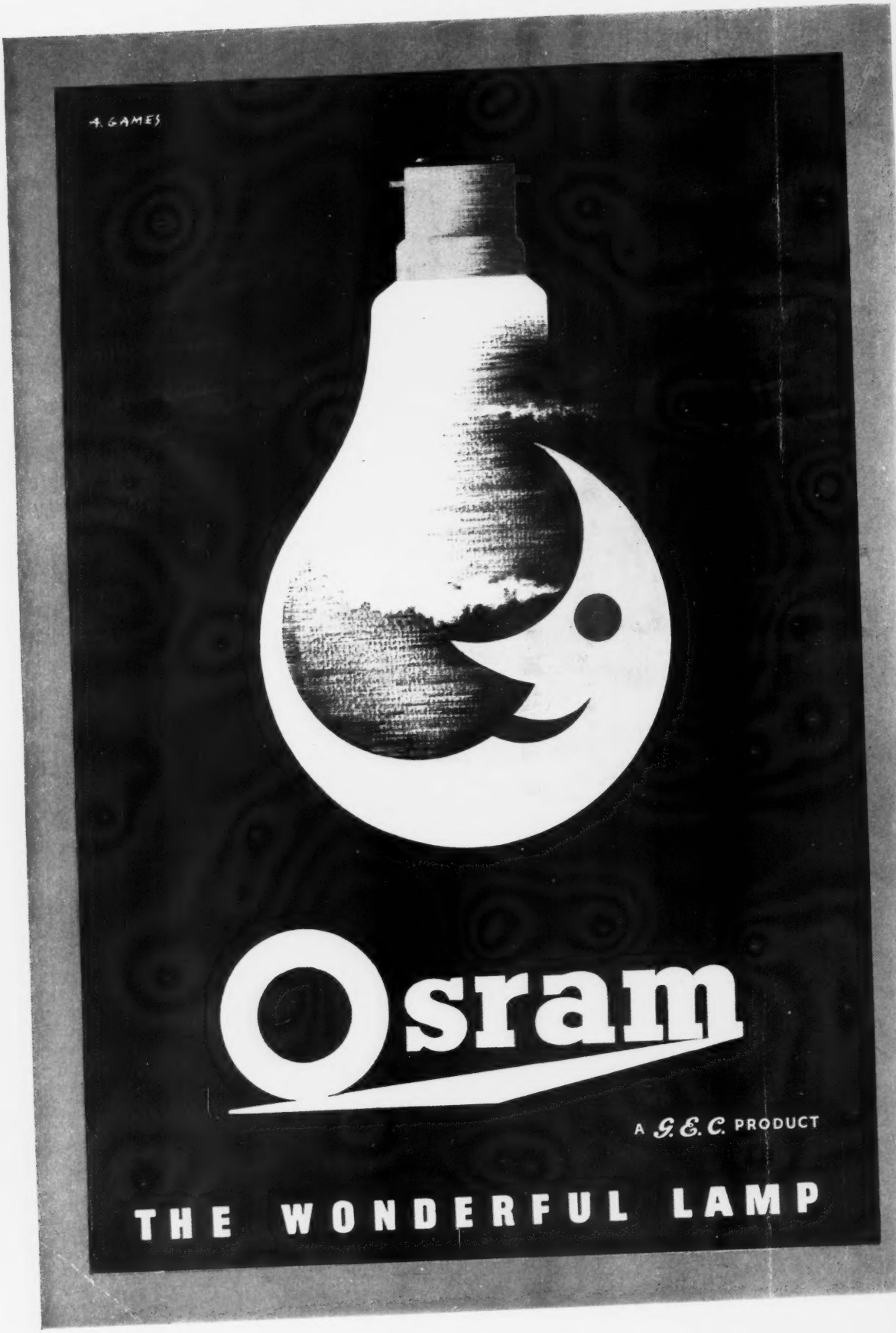
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